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PACIFIC BASIN COMMUNICATIONS STUDY

VOLUME II (of II)

prepared by the
Public Service Satellite Consortium

for the
National Aeronautics & Space Administration
and the
National Telecommunications & Information Administration,
U.S. Department of Commerce

Elizabeth L. Young
Principal Investigator

Jane N. Hurd
Project Coordinator

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2480 West 26th Avenue
Denver, Colorado 80211 • (303) 458-7273
TWX: (PSSCTG DVR) 910 931-2686

October, 1981

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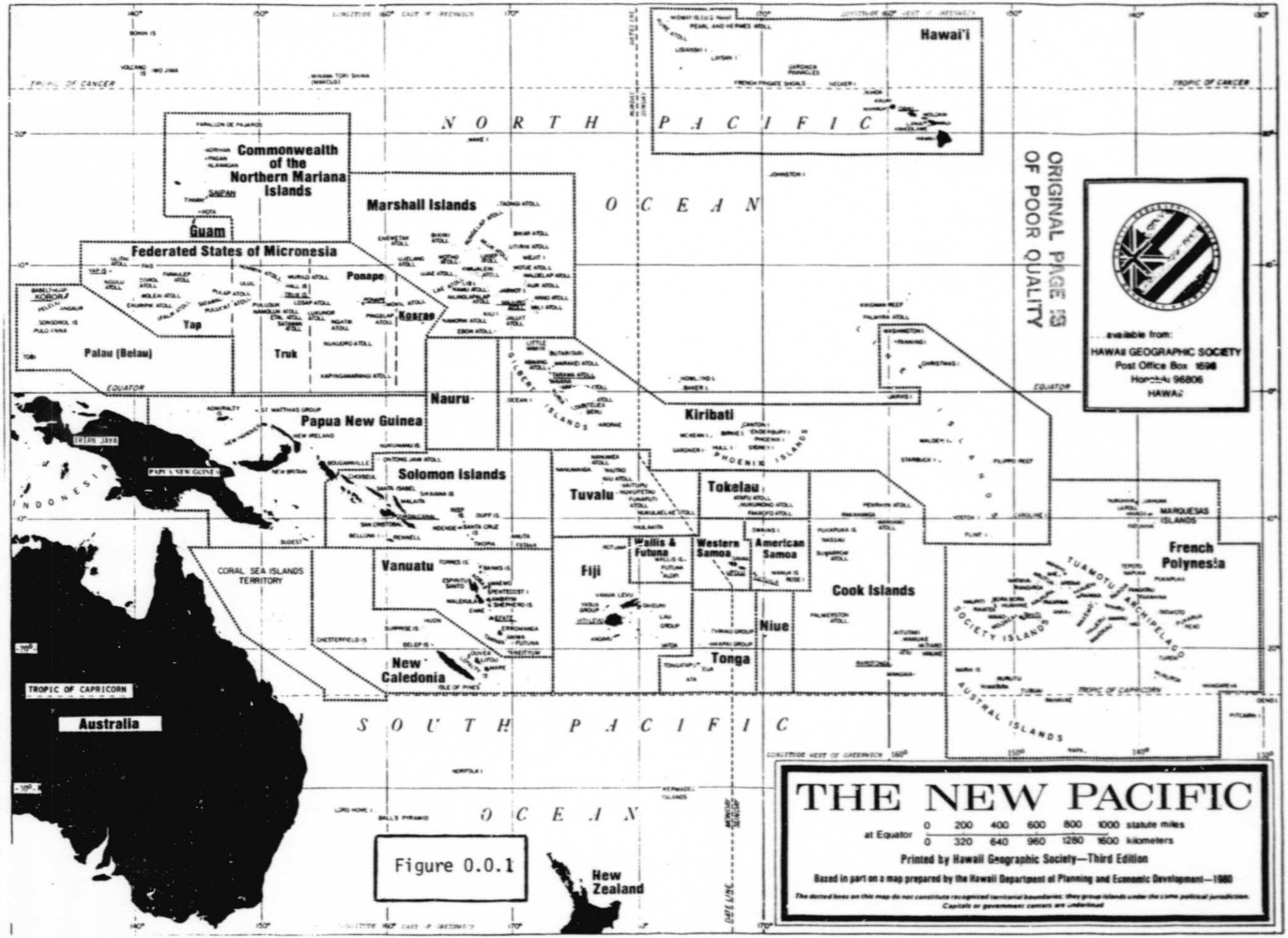
NORTH PACIFIC OCEAN
SOUTH PACIFIC OCEAN
Hawai'i
Commonwealth of the Northern Mariana Islands
Guam
Federated States of Micronesia
Marshall Islands
Ponape
Kosrae
Yap
Palau (Belau)
Truk
Nauru
Papua New Guinea
Kiribati
Solomon Islands
Tuvalu
Tokelau
Wallis & Futuna
Western Samoa
American Samoa
Vanuatu
Fiji
Cook Islands
Niue
Tonga
New Caledonia
French Polynesia
MARQUESAS ISLANDS
TUAMOTU ARCHIPELAGO
SOCIETY ISLANDS
AUSTRAL ISLANDS
PHOENIX ISLANDS
GILBERT ISLANDS
CORAL SEA ISLANDS TERRITORY
Australia
New Zealand
INDONESIA
IRIAN JAYA
PAPUA NEW GUINEA
TROPIC OF CANCER
TROPIC OF CAPRICORN
EQUATOR
LONGITUDE 160° EAST OF GREENWICH
LONGITUDE WEST OF GREENWICH
ORIGINAL PAGE IS OF POOR QUALITY
...available from:
HAWAII GEOGRAPHIC SOCIETY
Post Office Box 1698
Honolulu 96806
HAWAII
THE NEW PACIFIC
at Equator 0 200 400 600 800 1000 statute miles
0 320 640 960 1280 1600 kilometers
Printed by Hawaii Geographic Society—Third Edition
Based in part on a map prepared by the Hawaii Department of Planning and Economic Development—1980
The dotted lines on this map do not constitute recognized territorial boundaries; they group islands under the same political jurisdiction.
Capitals or government centers are underlined

Figure 0.0.1

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Chronology of Visits

January 9, 1981

Departed Washington for Honolulu, Hawaii (Jane Hurd)

January 11-14, 1981

Pacific Telecommunications Conference
Honolulu, Hawaii

January 15-16, 1981

Pacific Communication Workshop
East-West Communication Institution
East-West Center

January 18, 1981

Departed Honolulu for Pago Pago (Jane Hurd and John Witherspoon)

January 19, 1981 AMERICAN SAMOA

a.m. Aliki Sene
Director of Communication
Government of American Samoa

Anita Tolmie
Office of the Governor

William Surber
COMSAT Station Manager

John Flanigan
PEACESAT Terminal Manager
College of American Samoa

Lt. Governor
Tufeli Lia

p.m. Joseph M. Pereira
Director, Economic Development & Planning

Dr. John Hess
Director
LBJ Center for Tropical Medicine

January 20, 1981

Captain Oliver Maiava Hunkin
Director, Port Administration

Captain John Calver, Manager
Captain Reid, Training Officer
Port Authority

Michael R. Salā
Public Safety Commissioner

Paul Stevenson
Curriculum Development Specialist
Department of Education

Allan Ebel
Technical Director
KVZK-TV

Pene Failautusi
Production Manager
KVZK-TV

January 21, 1981

Departed Pago Pago for Apia
(8 hour airport delay)

January 22, 1981 WESTERN SAMOA

a.m. Lawrence Hewitt
Director, Telecommunications
General Post Office

Dennis Halliday
UNDP, Resident Representative

p.m. Tile Laumea
Falani Toufilau
Telecommunications Division
General Post Office

Ed Williams
Director, General Post Office

Tom Kuhlman
Economic Development & Planning

January 23, 1981

Carolyn Gullatt
Director, U.S. Peace Corps

January 24, 1981

Day trip to Savaii. Flew into Salelelonga and drove to health stations and administrative centers along northeastern coast of Savaii.

Barry Jackson
former telecommunications official

January 25, 1981

Joe Brown
2AP Radio

January 26, 1981

a.m. Ai'i Pili Moreau
Development Manager
WSTEC

Philip Penn
Bureau of Statistics

J. Sapolu
Rural Development Officer

Mr. Vito
Secretary to the Government

p.m. Dr. Felix Wendt
Director, U.S.P. Agricultural Extension

Ioane Malaki
George Hubband
USPNET

January 27, 1981 NIUE

Departed Western Samoa for Cook Islands with a 5-hour stop in Niue

a.m. Robert Rex, Jr.
Minister of Communications

John Scutts
Acting Director, Telecommunications

January 27, 1981 (Continued)

p.m. Arrived Rarotonga, Cook Islands

January 28, 1981 COOK ISLANDS

a.m. Stuart Kingan
Scientific Officer
Cook Islands Government

Dr. Pupuke Robati
Minister for Communication
Postmaster General

Trevor Simmons
Chief Postmaster

p.m. Dennis Mattocks
Manager, Cable and Wireless

Wade Sivoboda
ZKIKD Radio

Pape Aviu
Telecommunication Training Center

January 29, 1981

John Witherspoon departed for the U.S.

Nihi Vini
Director, Outer Island Affairs

Noora Tangaroa
Radio Cook Islands

Geoff Liew
Planning and Development

Mehau Kave
Acting Secretary
Trade, Industry, Labor, Transportation

Paul MacDonnell
Attorney for Trade, Industry, Labor, Commerce

Mrs. Akaiti Ama
Director, Labor Relations

January 30, 1981

a.m. George Cowan
Permanent Secretary for
Ministry of Public Works

Tangata Tutaka
Director, Customs

Itako Elisa (by HF link)
Senior Administrative Officer
Pukapuka Atoll

p.m. Kato Tama
Permanent Secretary for
Ministry of Agriculture

Tui Short
Permanent Secretary, Education

February 2, 1981 NEW ZEALAND

a.m. Departed Rarotonga for Auckland (Jane Hurd)

p.m. George Van Valkenburg
Consultant

February 4, 1981

a.m. Dr. Roger Green
Department of Anthropology
University of Auckland

p.m. Traveled from Auckland to Wellington

Honorable Russell Marshall
Member of Parliament

February 5, 1981

a.m. Richard Dols
Counselor
U.S. Embassy

Graham Fortune
Pacific Islands Division
Ministry of Foreign Affairs

February 5, 1981 (Continued)

p.m. Donald Murphy
Andrew Turpie
Derek Rose
NZ Post Office

Elsa Flavell
PEACESAT Terminal Operator

February 6, 1981

Waitangi Day

February 7, 1981

Roger Mackey
The Evening Post

Dinner with
Assistant Secretary, Foreign Affairs
Bryce Harland & Anne Harland

February 8, 1981

Departed Wellington for Auckland & Nadi, Fiji

February 9, 1981 FIJI

a.m. Departed Nadi for Suva

p.m. Graham Davey
Tom Weaver
International Telecommunication Union

February 10, 1981

a.m Ms. Sala Kunatuba
Department of Transport
Fiji Government

Bernado Vunibobo
Permanent Secretary for Civil
Aviation, Tourism, Transport

Mr. Philip Cameron
Travel Consultant

February 10, 1981 (Continued)

a.m. Visit at Orchid Island
Tourism destination

p.m. Tom Weaver
ITU

Robert Craig
USAID

February 11, 1981

a.m. Brian Crutcher
ITU Training Center

John Sheppard
Deputy Director
South Pacific Bureau for Economic Cooperation (SPEC)

Sale Va'ai
Legal Officer
SPEC

p.m. Emori Naqova
Director, Telecommunications
Post and Telecommunications Department

February 12, 1981

a.m. Raj Singh
Department of Tourism

Ambassador William Bodde
U.S. Embassy

Departed Suva for Nadi for Honolulu

February 12, 1981 (II) HAWAII

a.m. East-West Center
Pacific Islands Development Program
James Makasiale, Director
Pamela Pryor
Ed Scanlon, American Samoa
Dr. Macu Salato, Former Director General, SPC
Sumi Makey, Executive Officer, Open Grants

February 13, 1981

a.m. Renée Heyum, Curator
Pacific Collection
University of Hawaii

Russell Surber
Deputy Chief-designate of Mission
American Embassy, Suva

p.m. Dr. Jack Lyle
Director
East West Communication Institute

February 15, 1981

Departed Honolulu for Los Angeles and Washington, D.C.

February 16, 1981

Arrived Washington, D.C.

March 4, 1981

Departed Washington, D.C. for Rarotonga, Cook Islands (Jane Hurd)

March 6, 1981 COOK ISLANDS

Departed Rarotonga for Aitutaki (140 miles north of Rarotonga)

a.m. Matai Simiona
Chief Administrative Officer

John Tini
Public Works Department

Father George
Roman Catholic Mission

p.m. Dora Harrington
Cook Island Development Bank

March 6, 1981 (Continued)

p.m. Taraota Tom
Senior Police Constable

Jake Kliskey
Principal, Aitutaki School

March 7, 1981

Departed Rarotonga for Mangaia

a.m. Tua Tere John
Chief Administrative Officer

Ti Tangatakino
Senior Agriculture Officer

Periki Poira Periki
Radio Operator

Aro Kapiti
Public Health Officer

Nooroa Samuel
Premier's Department, Radio Network

p.m. Dr. Roro Daniel
Staff Physician
Mangaia Hospital

David Lewis
Principal, Mangaia High School

March 10, 1981

Departed Mangaia for Rarotonga

March 11, 1981

Neville Pearson
University of the South Pacific Center, Rarotonga

March 12, 1981

Departed Rarotonga for Nadi

March 13, 1981 (Jane Hurd joined by Joan Abramson)

Departed Nadi for Suva FIJI

Edward Beddoes
Minister for Transportation, Tourism and Civil Aviation

Berenado Vunibobo
Permanent Secretary for Transportation,
Tourism and Civil Aviation

Graham Davey
ITU Pacific Telecommunication Project Director

March 16, 1981

a.ma. Linda Stillman
Deputy Chief of Mission
U.S. Embassy, Suva

Continued Discussions with
Graham Davey and Berenado Vunibobo

John Samy
Director, Central Planning Office

p.m. Rural Visits, Viti Levu
Accompanied by Mr. Vunibobo

March 17, 1981

a.m. James Davidson
Department of Agriculture

Malakai B. Gucake
Director of the Fiji Visitors Bureau

p.m. Ratu Epeli Kacimaiwai
Permanant Secretary of Education

Mr. Walia
Director, Secondary Education

March 18, 1981

a.m. Santha Prasad
Mr. Nundan
Cooperative Marketing Board

Jerry Tulama
Home Affairs Ministry

Maurice Apted
University of the South Pacific Extension Program

p.m. Hugh Leonard
Fiji Broadcasting Commission

Jerry Nacoke
Ministry of Cooperatives

Vijay Singh
Acting Commissioner Central

March 19, 1981

a.m. Dr. Timoci Bavadra
Ministry of Health

Dr. M. Biumaiwai
Permanent Secretary of the Ministry of Health

p.m. Roadtrip to Nayavu with Emori Naqova, Director, Telecommunications

Nayavu Post Office and Radio Center

Dr. Vinod Prasad
Rural Medical Officer

Jim Gilchrist, Principal
Seventh Day Adventist Secondary Boarding School

March 20, 1981

a.m. Jack Takala
Permanent Secretary for Fijian Affairs

Arthur Holcombe
UNDP Resident Representative in Suva

Linda Stillman
DCM, United States Embassy

March 29, 1981 (Continued)

p.m. Departed for Savusavu, Vanua Levu

March 21, 1981

Robin Mercer
Manager, Namale Plantation

March 22, 1981 (UNITU Project Manager, Graham Davey accompanied team)

Departed Suva for Vila, Vanuatu VANUATU

Geoff Sweet
Director of Telecommunications

Toured rural Efate--visited the site of a new solar powered microwave installation

March 23, 1981

George Pakoa
First Secretary
Ministry of Transport, Works & Communication

Ian Young
Assistant Director of Central Planning

Derrick Butterfield and Lawrence Garisese
Ministry of Education

Barry Weightman
Director of Agriculture and Development

Joe Carlot
Managing Director of Radio Vanuatu

March 24, 1981

Howard Van Tries
Director, USP Extension, Vanuatu

Alan Brooks
Chief Engineer, Hebritel

Graham Taylor
Post Office Department

March 24, 1981 (Continued)

Dr. DeWilde
Director of Preventative Medicine for the Ministry of Health

Jerry Marsden
Deputy Director of the Local Governments Program

James Ormsbey
Hotel Manager

March 25, 1981 SOLOMON ISLANDS

Departed Pt. Vila for Honiara, Solomon Islands

Dr. Peter Beck
Permanent Secretary for Transportation and Communications

James Simister
Comptroller, Department of Posts and Telecommunications

March 26, 1981

Colin Brooker
General Manager of SOLTEL

M. McNaughton
Senior Planning Officer, Central Planning Office

T. Rissettio
Chief Administrative Officer of the Ministry of Home Affairs

E. Kimele and Staff
Director of Solomon Island Planned Parenthood

Alfred Nori
S.I. Department of Justice
Addressed a group of Solomon Island Women on "Women's Rights in the Solomon Islands."

March 27, 1981

John Holloway
Commissioner of Police and Chief Immigration Officer
and Disaster Coordinator

Bart Kirby
Solomon Islands Broadcasting Corporation

March 27, 1981 (Continued)

Winston Tshe
President of the S.I. Chamber of Commerce

Hugh Paia
Director of USP Extension

Dinner with Mr. Tshe and Mr. Yuen, Asian Development Bank

March 28, 1981

Departed Honiara, Guadalcanal for Malaita

a.m. Mr. Taati
Auki Postmaster

Visited Auki Transmission Station, Post Office, Radio Telephone and Telex Office

p.m. Mr. David G. Ruthven
Clerk to the Malaita Provincial Assembly

H. MacArthur
A Timber Businessman

Toured outlying areas of Auki

March 29, 1981

Davey departed Solomon Islands for Papua New Guinea

March 30, 1981

Diana Goodwillie
YMCA, South Pacific Division

Mr. Rusty Russell
Permanent Secretary of the Ministry of Agriculture and Lands

Mr. George Scott
Surveys Department

Jeffrey Siapu and David Lilimai
Department of Education

March 30, 1981 (Continued)

Christine Maeda and Staff
Women's Interest Program

Eddie Nelson
Permanent Secretary for Health

p.m. Accompanied Dr. Peter Beck to the Areligo Training School about 30 kilometers outside Honiara. Visited Peace Corps Women's Training Program.

Dinner with Dr. and Mrs. Beck, Terry Murphy, County Director for the U.S. Peace Corps in the Solomons and Judith Murphy.

March 31, 1981

a.m. Ministry of Natural Resources

Hurd and Ambramson departed Honiara for Port Moresby, Papua New Guinea

p.m. Met by Graham Davey and Foreign Affairs officers

April 1, 1981 PAPUA NEW GUINEA

Mr. Peter Raka and Mr. Moimu Raka
Ministry of Foreign Affairs

Department of Education Curriculum Planning Division

Ron Brew
Assistant Director, Area Planning and Project Implementation

National Planning Office

Mr. Paulius Matane
Permanent Secretary for Foreign Affairs

April 2, 1981

a.m. Ian Hay
Executive Officer
Civil Defense

Major Standen
Police Communications Officer

p.m. Terry Wallaston
Assistant Director for Planning,
Department of Telecommunication

April 3-4, 1981

Visit to the Provincial Center at Sogeri.

Departed Port Moresby.

Visit to Provincial Center at Goroka, Eastern Highlands.

Toured remote areas along Highlands Highway from Kainantu to Kundiawa, Chimbu Province.

April 5, 1981

Departed Goroka for Port Moresby

April 6, 1981

P. Sai'i
Deputy Secretary
Department of Primary Industries

Ron Johnston
Assistant Secretary of Telecommunications
Ministry of Public Utilities

Karen Woodbury
U.S. Peace Corps Country Director

Tim Hamilton
Deputy Chief of Mission, U.S. Embassy

April 7, 1981

Mr. W. Wekina
Permanent Secretary, Ministry of Commerce

Karen Woodbury and Tim Hamilton
U.S. Embassy

April 8, 1981

Idau Tau, Planner
Central Provincial Government

Abramson departed for Honolulu
Hurd " " FIJI
Davey " " Australia

April 13-21, 1981

Planning for Users' Meeting FIJI

April 22, 1981

Hurd departed for Washington, D.C.

May 23, 1981

Abramson and Hurd departed Honolulu for Micronesia

May 24, 1981 FEDERATED STATES OF MICRONESIA

Arrived Ponape, Federated States of Micronesia

Meeting with Kikuo Apis, Special Asst. to the President, FSM

May 25, 1981

Carol Mihalko, Curriculum Supervisor
Department of Education

Visited rural Pingelapese Village
Mand, Madolenihmw Municipality

Salis Peter, Forester
Madolenihmw Forestry Station

May 26, 1981

Bob and Patti Arthur
Owner/Managers
Village Hotel

The Honorable Tosiwo Nakayama
President
Federated States of Micronesia

May 26, 1981 (Continued)

Yosiwo George
Secretary
Department of Social Services
Federated States of Micronesia

Bermin Weilbacher
Acting Secretary
Department of Resources and Development
Federated States of Micronesia

Quirino Mendiola, Chief
Immigration & Labor Division
Department of Resources and Development
Federated States of Micronesia

John Sohl
Federal Programs Coordinator
Office of Planning & Statistics
Federated States of Micronesia

Davey arrived Ponape

May 27, 1981

a.m. Matt Mix
Advisor
Ponape Federation of Consumer Cooperatives

Wally Watering
Superintendent
Public Safety
Ponape

Lee Stephens
Chief
Division of Public Safety
Federated States of Micronesia

ATS I Exchange
Discussion with
Dr. Louis Bransford
Public Service Satellite Consortium

May 27, 1981 (Continued)

p.m. Pedro Harris, Chief
Planning Division
Federated States of Micronesia

Paul Gallen, Director
Department of Education
Ponape

May 28, 1981

Tom Bryan, Public Information Officer
Federated States of Micronesia

Elliot Rosenberg
Economic Development Authority
Ponape

Visited Sokehs Powe School
Aaron Lebehn, Principal
Noah George, Teacher

Visited Pehleng, Kitti - Municipality sites of proposed Federated States of Micronesia government complex.

Dinner with: John Sohl
Pedro Harris
Allen Mackey, Management and Training Consultant

May 29, 1981

a.m. Visited Ponape Agriculture & Trade School
Rosendro Andrews
Assistant Director for Administration

Fr. Hugh F. Costigan, S.J.
Director, PATS

p.m. Dr. Alexander Panuelo, Director
Health Services, Ponape
Denion Jack
Dr. Simeron Jim

James T. Movick, Deputy Chief,
External Affairs.

Dinner with
Ihlen and Bermina Joseph

May 31, 1981

a.m. Dr. Paul Ehrlich
Historical Sites Consultant

p.m. Nanmwarki Johnny Moses
Traditional Chief
Uh Municipality

June 1, 1981

a.m. Noriwo Ubedei
Principal
Ponape Islands Central School (PICS)

Ehson Johnson
Vice Principal

p.m. Visited proposed COMSAT earth station site

R. Vega, Staff Agriculturist
Department of Agriculture
Ponape

Adelino Lohrens
Assistant Agriculturist

Dave Cliff, Operational Manager
Helgenberger Enterprises

Francis Zarred
Director, WSZD Radio

Dan Perin, National Planner
Office of Planning & Statistics

Alan Burdick, Staff Counsel
Commission on Future Political Status and Transition

June 2, 1981

a.m. Leo Falcam, Governor, Ponape
Strik Yoma, Lieutenant Governor

State of the Nation Address
President Tosiwo Nakayama

June 2, 1981 (Continued)

a.m. Elias Thomas, Senator
Congress of FSM

p.m. Traveled to Guam

Resio Moses, President
College of Micronesia

June 3, 1981 REPUBLIC OF BELAU

a.m. Traveled from Guam to Republic of Belau

Philip Sosey, Director of Communication
Trust Territory Government

Bena Sakuma, Director of Demonstration Projects
Palau Community Action Agency

p.m. Fumio Rengiil, President
Rengiil Bros., Co.

Dr. Minoru Ueki, Director, Health Service
Dr. Tony Polloi, Director, Public Health
Dick Griffin, Health Services Administrator
Julie Myer, Health Planner

Visited Rural Koror
Katharine Kesolei, Director
Palau Community Action Agency

June 4, 1981

Visited Outpatient clinic, Palau Hospital

Dick Williams, Statistician
Yoichi Suzuki, United Nations Associate
Cisco Ngirailemesang, Office of Planning

President Haruo Remichliik
Republic of Belau

Moses Ramarui, Assistant to the President

Captain J. I. Stohl, Belau Police Force

Herman Francisco, Director Agriculture

Visited Rock Islands south of Koror

June 5, 1981

Sue Reid, Peace Corps Volunteer, Health Educator

Traveled to Ngaremlengui, west coast, Babelthuap Island
HEADSTART graduation

June 6, 1981

Fr. Felix Yaoch, S.J.
Catholic Mission,
Trust Territory

Traveled to Guam

June 7, 1981 GUAM

Visited rural south coast of Guam

June 8, 1981

Paul Calvo
Governor of Guam

June 9, 1981

Traveled to Nauru

June 10, 1981 NAURU

a.m. John Duncan
Director, Telecommunications

Leo Keke,
Permanent Secretary
External Affairs

Visited phosphate excavation site

p.m. Traveled to Fiji.

Departed Nauru for Fiji

June 11, 1981 FIJI

Attended opening of Regional Telecommunication Training Center

June 16, 1981

Visited His Excellency Dr. Ako Toua
High Commissioner,
Government of Papua New Guinea

His Excellency Kamuta Latasi
High Commissioner
Government of Tuvalu

p.m. His Excellency Reginald Sakiui
Consul General,
Consulate General of the Republic of Nauru

June 17, 1981

a.m. His Excellency William Bodde, Jr.
Ambassador, United States of America

p.m. Ikipa Tongatule
Gyan Singh
Sale'imoa Va'ai
South Pacific Bureau for Economic Cooperation

June 18, 1981

a.m. L. Waters, Deputy High Commissioner
Australian High Commission

June 19, 1981

a.m. His Excellency Michael Powles
High Commissioner
Government of New Zealand

p.m. Ben Whiting
Posts and Telecommunications Department

June 22, 1981

a.m. His Excellency William Bodde
U.S. Ambassador

Tuesday June 23 through Thursday June 25, 1981

Users' Meeting
SPEC Headquarters

June 27-28, 1981

Attended Action Committee for Women in Need program
on Women's health

June 29, 1981

Isabel Lopes Dias
UNDP

Esiteri Kamikamica

June 30, 1981

Departed Suva for Nuku'alofa, KINGDOM OF TONGA

Wednesday, July 1, 1981 TONGA

a.m. Taniela Tufui
Secretary to Government

Cecil Cocker
John Lockholm
Department of Planning

p.m. Tomasi Simiki
Division of Agriculture

July 2, 1981

a.m. Na'a Fiefia
Division of Education

Taniela Koloa
Fisheries Officer

July 2, 1981 (Continued)

a.m. Haini Tonga
Chief Superintendent, Police

p.m. Tavake Fusimalohi
Manager
Tonga Broadcasting Commission

Opeti Lutui
Acting Director, Health

Salesi Kantoke
Acting Secretary, Health

July 3, 1981

a.m. Salote Fukofuka
Acting Director
USP Center

July 4, 1981

Attended King's birthday celebration

Traveled from Tonga to Fiji

July 5, 1981

Abramson departed for Australia

July 6, 1981

James Houston
Project Officer
Education and Training Division
Commonwealth Fund for Technical Cooperation
Commonwealth Secretariat
London

Paul E. Sotutu
Chief Liaison Officer
ESCAP (Economic and Social Commission for Asia and the Pacific)
Nauru

July 7, 1981

Hurd departed for the United States

USERS' MEETING SUMMARY REPORT

Pacific Basin Communications Study

Suva, Fiji

24-25 June, 1981

Wednesday June 24, 1981

OFFICIAL OPENING:

1. Mr. Ikipa Tongatule, on behalf of the Director of the South Pacific Bureau for Economic Cooperation, welcomed guests, participants, observers and Public Service Satellite Consortium staff members to the SPEC headquarters. A copy of the welcoming addressed is annexed. (Annex 1).

2. The meeting then unanimously elected Dr. Macu Salato to the chair.

3. In thanking the meeting for the honor of electing him to the chair, Dr. Salato pointed out that most Pacific island states recognize the need for rural telecommunications, and that since the Pacific nations are located in a disaster prone area, they are very conscious of communication needs for emergency purposes. He then called upon the meeting for active participation to provide input for PSSC to take back to the United States.

4. The Chairman invited Dr. Louis Bransford, Vice President of the PSSC to address the meeting. Dr. Bransford's statement is attached in annex 2.

5. The Chairman then introduced the Honorable Livai Nasilivata, the Minister for Works and Communications, Fiji, and invited him to formally open the meeting.

6. In his address, the Minister commented on the importance of communication in rural development throughout the Pacific and the

multisectoral nature of communication development in rural areas. The Minister noted that the meeting brought together communications users of a wide range of professional responsibilities to discuss telecommunication issues and pointed out that such discourse was too often lacking. In concluding his remarks he charged the participants with the responsibility of providing full and accurate information to fulfill the goals of the meeting. Finally the Minister wished the meeting every success in furthering efforts to improve rural telecommunications, and declared the meeting formally open. The full text of the Minister's remarks are attached in Annex 3.

7. Mr. Kikuo Apis, Special Assistant to the President of the Federated States of Micronesia expressed his sincere appreciation to the Minister, PSSC, SPEC, the Government of Fiji and the ITU on behalf of the participants. (See Annex 4 for the full list of participants).

DESCRIPTION OF THE STUDY:

8. The Chairman introduced Jane Hurd, Project Coordinator of the PSSC for Pacific Basin Communication Study, John Witherspoon, Project Consultant and Joan Abramson, Project Consultant who provided a description of the study.

9. Jane Hurd briefly described the background of the countries' interest in regional telecommunications planning and referred to the Forum's creation of SPEC and SPEC's mandate to coordinate regional telecommunications development.

10. She discussed the involvement of ITU at the request of the Pacific Island's Governments, the opening of the regional ITU office in Suva in

in 1975, and the Forum's request through SPEC in 1976 to assist in rural telecommunication planning. Island nations have substantially improved international communication and by 1981 most either have earth stations working to the INTELSAT system or have firm plans for provision.

11. In 1980, at the Forum Meeting in Kiribati, the Prime Ministers charged SPEC to advise major providers of space segment that the Forum nations were interested in sharing satellite time. The Forum leaders recognized the growing gap between urban and rural telecommunications and the need for reliable, inexpensive, low maintenance systems of adequate quality in order to further rural development.

12. John Witherspoon discussed the long term interest of the United States in Pacific Telecommunication development. He noted that in 1963 the President of the United States stated as national policy that the United States wished to share the benefits of space technology with the world. Mr. Witherspoon then described the United States involvement through ATS - 1 satellite in such specific projects as the USPNET, the Trust Territory DISPNET and PEACESAT. He explained that the Public Service Satellite Consortium also had a long history of involvement in Pacific telecommunications as manager of the DISPNET.

13. Ms. Hurd stated that the meeting is unique because of the variety of disciplines represented by the participants, and that the entire study is unique because it is both regional and user-oriented.

14. Ms. Hurd reported that the study has been carried out in three stages: First, a report (Phase I report) was submitted to NASA and the

U.S. Department of Commerce describing extant and proposed telecommunication systems throughout the region including telephony, telegraphy, telex and broadcast radio. Second, site visits were conducted to check telecommunications data and to discuss user needs with the people whose professional, traditional and personal roles require adequate means of communicating from and with the rural portions of their nations. Third, technological options for Pacific islands users were developed.

15. The site visits were carried out between January and June, 1981. In January and February, Hurd and Witherspoon visited four Polynesian entities: American Samoa, Western Samoa, the Cooks and Niue. In March and April Hurd, Abramson and Graham Davey, I.T.U., completed visits to Fiji, Vanuatu, the Solomon Islands and Papua New Guinea.

16. In each country they talked with leaders from a broad spectrum of government ministries, with members of the private sector and with traditional leaders. In each country they visited remote rural areas whenever practicable.

17. During the time site visits were being conducted, engineers on the project were working (in Washington D.C.) on examining the technical options that might produce suitable telecommunications systems to meet these user needs. The site visits produced large volumes of data in which recurring themes appeared. An outline was then developed for the final report. This outline appears on pages 10 through 12 of the interim report.

18. Information from the country visits will be described in the final report under three categories:

1) philosophy of national development

2) management of human resources

and 3) management of economic resources.

The relationship between these themes and communication needs is developed in the final report.

19. PSSC advised that the final report to NASA, the Department of Commerce, ITU, SPEC, and the Pacific Islands governments will be completed by August 31, 1981.

20. At the Chairman's invitation for comments, Mr. Tukituku emphasized that an important factor is human resources--the availability of skilled people in the regions. The technical option chosen depends upon the skill of the people to maintain and operate the system. He expressed concern that the planning of infrastructure is sometimes left to the last minute.

21. It was noted that some modern equipment was in practice easier to maintain and operate than much of the technology of yesterday. Developing countries should now be in a better position to purchase appropriate state of the art technology more cheaply than ever before.

22. The chairman noted that there were no further comments or questions and moved on to Dr. Bransford's presentation.

DESCRIPTION OF SERVICES AND APPLICATIONS

23. Dr. Bransford stated that the purpose of the session was to describe services and applications of telecommunications that are appropriate for the Pacific. His comments and those of Mr. Witherspoon would cover three categories:

1) A review of the problems expressed by users in the Pacific.
2) Telecommunications services that could help solve the problem, that are available, feasible and affordable. What fits, ranging from simple telephony and telex to full-motion video? What are the tradeoffs, both economic and technical?
3) Pacific user applications.

24. He noted that some of the service categories to be included were:

a) Emergency communications for both civil and medical purposes.
b) Communications to foster development by business and government
c) Training and education (both formal and informal) in areas such as health and medicine, public and private education, higher education, agriculture, forestry, fisheries.
d) General communication service applications including news programs, cultural programs, special events, library services.

25-26. John Witherspoon described typical examples of telecommunication for economic and human resource development. He described the use of broadcast radio for educational purposes and the USPNET, (an extended point to multipoint voice connection via satellite for Extension Services tutorial and for handling administrative matters for the USP extension service.)

27. Mr. Vini noted the problem of using fixed scheduled radio. Often urgent matters must be delayed because of time schedules. He concluded that the problems were generally known and that it was more important for the meeting to concentrate on discussions of solutions, for example, to provide services on demand rather than at scheduled times allocated by an authority other than the particular users.

28. Mr. Pakoa raised the issue of surveillance for the fishing industry basic to many of the Pacific nations. He stated that Vanuatu has thousands of square miles it must survey and that vessels for such surveillance are beyond the resources of the nation. It would be useful to send a boat out only to catch an intruder, rather than to patrol at all times, which is very expensive.

29. After some discussion by the meeting the Chairman summarized the consensus that the issue of surveillance was important and noted that the Pacific countries do not have sufficient boats to patrol the 200 mile national limits. They must look to technology to increase the efficiency of surveillance. "We are the owners of the ocean, but in name only" he stated.

30. Mr. Tukituku raised the issue of disaster relief and asked if the present state of technology would enable Pacific nations to communicate to outer islands during hurricanes and cyclones. He said, "Communications is the first victim during a hurricane".

31. The meeting concurred that getting information about oncoming hurricanes to the village is a communication problem of considerable importance.

32. Mr. Witherspoon diagramed the various types of communication: telex, telephone, facsimile, fixed image television, mobile communication, broadcast radio, high speed data, television. Telex and telephone appeared at the low end of the continuum of expense; facsimile fixed frame television, mobile and broadcast radio were in the middle; and high speed data and television were shown as expensive means of communication.

33. Dr. Bransford then discussed applications of telecommunication in rural isolated areas and described the success India had with its direct broadcast use of ATS-6 for the purpose of providing television broadcasts to Indian rural villages using extremely cheap antennae. India has recently launched a satellite for its own use. The Pacific would require cooperation for such a satellite. Various kinds of communication requirements were then matched to the costs described earlier.

34. The meeting noted that most requirements for personal communication, economic development, tourism, government administration, education and public service could be met with means of communication at the low end of the price spectrum. The use of such services as television and high speed data would be more costly.

35. Further, a number of issues affect the achievement of appropriate telecommunication technology. They include training, the question of ownership of the facilities, cost, and maintenance.

36. Mr.Latasi pointed out that many of the issues raised, such as training, are in fact national rather than regional issues. He stated that his problem in communicating with his country from Suva is that

phones work when they are not needed and are out of order when he needs them. He also said there is an issue of who pays for an adequate telecommunication system. In response to Mr. Latasi's concern, Dr. Salato said that training is a national issue but, it is also a region-wide concern and like a number of other issues, such as fishing surveillance, solutions may better be found on a regional basis.

TECHNICAL OPTIONS

37. The chairman introduced Mr. Walter Morgan, a telecommunications consulting engineer, who reviewed a range of technical options to meet the user needs information compiled by the field survey teams.

38. Mr. Morgan first reviewed the existing submarine cable systems and satellite earth stations installed and working in the Pacific basin. He further presented a methodical review of the existing satellites presently in orbit which have footprints in the Pacific region. It was noted by the meeting that the only satellites covering the area required were ATS-1--with a very limited remaining life span and insufficient bandwith capacity to meet the requirements, and INTELSAT satellites--designed specifically with low radiated power for very large expensive international earth stations; INTELSAT therefore has only limited possible rural applications.

39. The discussions then centered on the need to quantify the demand and some of the empirical models that Mr.Morgan had built up from the field data. The correlation between the number of telephones per capita and the GNP per capita of countries has been long established. An interesting extension of this was a direct correlation found also between the GNP ratio between two countries and the imbalance of traffic between them.

40. A correlation was attempted to quantify telephones per population against population to see if a population based correlation existed for telephone demand. The chart was described by the consultant as a "fly speck" diagram as no best-fit empirical function could be ascribed to it beyond a very large and irregular area of fit which would be useless for projection of demand for telephones. One implication that may be possible from this is that national traffic between rural and urban areas is also a function of the local economic wealth.

41-42. However, it would only be possible to verify this postulation by estimating economic wealth (GNP) in local areas - a very difficult and expensive exercise. If this were practicable and the correlation held true as for whole countries, it may also be found that the traffic proportions in each direction also correlate in relation to relative wealth between the urban and rural areas. An analogy was also given by reference to what had happened to the traffic patterns between ships at sea and between ship to shore in the MARISAT system compared with the patterns when only HF radio morse was used. After some discussion from the floor, the Chairman noted that this was an interesting exercise for the high level academic theoreticians and no doubt will be taken up as a research item by them.

43. Mr. Morgan discussed national telecommunications hierarchial solutions and how these, when related to various technologies available would optimally look quite different to the classic developed country nodelink multilayered pyramidal structure.

44. Concluding the discussions on system structures and traffic patterns, Morgan point out that models and experience elsewhere should not be slavishly followed in the Pacific Islands, as many would be found to be inappropriate.

45. The final portion of the talk centered on a wide range of optional technologies available and which could become available, to provide the bearer systems to carry the telecommunication services needed. In further discussing satellites as one aspect of this range, Mr. Morgan gave an exhaustive review of what could be done with a range of different satellite configurations and frequencies to provide for small Pacific Islands. Several representatives, however, remarked that this was for the future and that an immediate satellite solution is not available.

POLICY IMPLICATIONS

46. Graham Davey stated that the two previous sessions had dealt with service and technical options and that this session would consider some policy implications of these options.

47. In response to a question from Mr. Apis it was explained that the SPEC study would concentrate on terrestrial systems, INTELSAT application for some requirements, and would provide an input for planning for possible provision by a future Australian DOMSAT system. The PSSC study on the other hand describes user needs and concentrates on satellite solutions outside the expertise of the SPEC study and a specialty of the

USA. The two studies are therefore complementary, with a detailed study of the need, together with a full range of options for national government consideration expected to result.

48. Four important implications to be considered in the choice of systems and service are:

1) time to implement
2) the trained manpower resources required for provision
3) the future ease of expansion of any system

and 4) flexibility of service which could be provided by the service.

49. Discussion on each of these considerations highlighted the following points:

1) Time to implement
   a) There is no suitable satellite immediately available to provide for all Pacific Island rural telecommunications needs. The earliest likely date for such a suitable satellite would be five years hence.
   b) Once a suitable satellite were provided the ground segment (earth stations) could be provided much more rapidly than could terrestrial systems.
   c) Terrestrial systems are being provided now and will and will continue to be provided, but meeting rural communications requirements in this way will take a very long time.

2) The trained manpower resources for implementation.

   a) Analysis of the user needs provides the input for a satellite system design. The design, building and launch of the satellite requires no professional resources from the countries. The provision of suitable small aperture earth stations requires only one tender specification for a limited range of sizes for all Pacific Island countries. The professional resources for installation are minimal.

   b) The professional manpower resources for planning, specifying and installing terrestrial VHF, UHF and microwave systems is considerable.

3) The future ease of expansion.

   a) Once a suitable satellite is available, small dish earth stations can be installed easily and rapidly. When additional circuits are required or new services are required, the network on earth stations can be quickly increased. Expansion of terrestrial systems cannot usually be accomplished as quickly and the capacity of the rural system is not easily expanded.

4) Flexibility of service

   a) Terrestrial systems for rural telecommunications are usually designed for voice service and it is difficult to provide wide band services if required on these systems.

b) Satellites can enable a very wide range of service to be provided at relatively short notice, from narrow band telegraph through to wide band data and television.

50. The meeting discussed different satellite types and earth station requirements. Walter Morgan and John Witherspoon answered a wide range of questions on typical satellite operation, and the possibility of space segment availability on the INMARSAT system, the AUSTRALIAN DOMSAT system and the INTELSAT system. The background to Australia's offer of space segment to Papua New Guina, together with a brief resume of why Australia could not footprint the rest of the region in the first launch was given. The limitations of the INTELSAT system for rural application were reiterated and the agreed input from INTELSAT engineers to study and advise the countries of where INTELSAT stations could be applied was discussed. The institutional constraints against use of INMARSAT were described however the remote possibility of a short term interim arrangement with INMARSAT was discussed and noted by the meeting.

51. Dr. Beck stated that he was disappointed that there was currently no coverage that was appropriate for the Pacific area and that Pacific nations must continue to use old and inadequate existing systems.

The Solomon Islands spread almost 1,000 miles from east to west, he said, and his advisors tell him that satellites are the appropriate solution; now, however, he is hearing that there is no solution near at hand.

Mr. Davey advised that INTELSAT may be the preferred solution for the larger rural towns in the Solomon Islands but that this needed investigation. The SPEC study has arranged an INTELSAT input to provide this information.

52. The Chairman, Dr. Salato, summarized the feeling of the meeting when he stated that he would have thought the developed countries would have given more thought to the needs of the Pacific. He stated that he was appalled at the delay in achieving satellite coverage for the area and suggested that the meeting record the need for efficient communication between the islands. Mr. Vini pointed out that the Pacific nations were small and had limited resources and must stand together or fall divided.

53. Mr. Davey emphasized that while the acquisition of satellite space segment was best accomplished regionally, the national usage of satellites was up to each nation. For example, one nation may decide that television in a capital city is higher priority than rural telephones for outlying areas. This is their national priority and their decision. The satellite provides a vehicle, but the use to which the vehicle is put is strictly a matter national policy.

54. He pointed out that there are some measurable benefits from telecommunications such as revenues they produce. There are also economic benefits which are impossible to quantify. But even these unmeasurable benefits must be taken into account at the policy level. He referred to

Minister Nasilivata's opening address on the issue of high cost of rural telecommunications and noted that, overall, "communications is a profitable business".

55. Mr. Pakoa asked if the high cost of rural communication could not be subsidized by making international communications more expensive. Mr. Davey responded that this is a common practice and is done successfully in many countries.

56. The discussion of the South Pacific Forum in Kiribati to share space segment on a regional basis and to advise potential providers of space segment was again noted in this context of regional cooperation. Considerable discussion then centered on the need for regional cooperation on the one hand, but national needs and prerogatives on the other.

57. The economies of scale of satellite systems were discussed and the need for regional cooperation to achieve the goal of economical space segment shared across as many users as possible. Dr. Toua pointed out the differing needs of users in each country and questioned the capability of a regional system to meet these differing national needs and differing policy objectives. Mr. Witherspoon again emphasized that satellite systems merely represent the capacity to communicate: that which is communicated is the business of each nation. He then stated that the sessions tomorrow would be focusing on some of the needs that might use such capacity.

58. Dr. Toua asked what organization would be responsible for a regional system, if such a system were a possibility and who would

benefit. Mr. Davey acknowledged that there were difficulties with regional shipping and air transport but pointed out that the telecommunication industry has history of cooperation quite different to most other industries. There are working models of satellite systems and indeed it is the usual pattern for each nation to pay only for its share of the actual use of the system. The problems of cost sharing in relation to benefits received did not therefore arise in the telecommunications industry in the way it does in other international ventures.

59. Dr. Vuli Mataitoga asked how satellite systems work in the United States for regional purposes.

60. Mr. Witherspoon said there were a number of US system but the only state with its own system was Alaska, which had unique requirements and good financial resources. He said there were some special purpose satellites in the US, such as high speed data satellites, but none of the satellites was intended to service single regions.

61. Dr. Vuli Mataitoga asked if a US type system would be useful in the Pacific. Mr. Witherspoon emphasized that it can be said about satellite systems that they are essentially simple and flexible: different countries would be used but the services would be completely different, according to each nation's needs.

62. Mr. Morgan pointed out that in the US satellites generally have multiple uses. Many were created for telephone traffic but use in U.S. only for such traffic was not economical, therefore they are also used

for data services, television and the like.

63. The meeting was advised that regional cooperation in the South Pacific in telecommunications had already resulted in significant gains with cooperation in the development and joint use of national training institutions, and the use of regional funds for telecommunications development. Institutionally the joint needs of the South Pacific countries was taken care of at the World Administrative Radio Conference, and both the PSSC study and the SPEC study of rural telecommunications would not be practicable without the united voice of the countries.

64. It was noted that further approaches to outside institutions and Governments were also more likely to be effective on a regional basis rather than a national basis. Mr. Davey pointed out that each country exercising its own national prerogative toward a progressive telecommunications policy was an important ingredient to successful regional cooperation.

65. The Chairman summarized the session noting the continued need for regional cooperation to press through all of the International channels available for the provision of suitable satellite space segment in the Pacific.

Thursday, June 25, 1981

DESCRIPTION OF COMMUNICATION NEEDS:

MANAGEMENT OF HUMAN RESOURCES

1. Mr. Davey assumed the chair in the absence of Dr. Salato. Referring to the Minister's opening remarks encouraging free and open discussion on the content of the PSSC interim report, Mr. Davey proposed that the session be conducted in the form of a panel discussion, with full participation by the PSSC team.

2. PSSC staff members then outlined some of the site visit findings relating to the management of human resources for development. Among them were the lack of sufficiently trained personnel, unequal distribution of health services, and the problem of isolation for workers in remote areas. several participants noted that there were specific difficulties in educating people to use telecommunication facilities even when those facilities were available. Mr. Vini described the problem as threefold: psychological (inhibitions about telephone use), economic (costly service), and social. That training is necessary for users as well as for those who must maintain such systems was mentioned by several representatives. Ms. Kaurasi noted that it is appropriate to do training in the use of modern technological equipment at the very early levels of schooling.

Dr. Toua pointed out that expatriates often approach the training problem without knowing the needs of the people living on the village level. He stated and Mr. Tukituku concurred that if one wants to communicate

to the right people then one must select the right people to do the communicating.

3. Mr. Faumuina expressed a related problem, the lack of incentive of local people to push ahead with training programs since, often, once one has achieved training, the incentives to remain in the field in which one is trained are limited. For example, wage structures often encourage people to change from the fields in which they were trained.

4. Mr. Apis agreed that there was a problem with training locals. Part of the problem, he said, is that expatriate workers often receive higher pay than their local counterparts, and the tendency is that expatriates are reluctant to train their counterparts to take over.

5. Mr. Vini stated that training is a failure where the counterpart expatriate is reluctant to share his knowledge with local people. When this happens it becomes a means of maintaining and perpetuating the system of using expatriates.

6. Dr. Toua continued to describe the problem of communication between expatriates and local people. The failure of expatriates to adequately train local people is a serious problem in PNG, which suffers an acute shortage of engineers. There is a dependence on expatriates at all work levels; they often do not train local replacements.

7. The meeting then discussed the problem of isolation for trained people particularly small countries where individually trained personnel

often have no peers with whom to share problems and exchange professional information. Small countries also have difficulties because they often have an insufficient population base from which to draw persons for specialized training. Mr. Tukituku stated that in Fiji they often make use of professional colleagues in other countries such as Australia, New Zealand and the U.K., especially when there was a need to resolve problems quickly.

8. Another problem of utilizing human resources in the Pacific, the meeting noted, is that inadequate communication structures contribute to the necessity for a large number of meetings which are expensive in terms of money and also in terms of drawing needed personnel out of service when their professional work is sorely needed. The meeting addressed another communication problem related to human resources utilization: Mr. Vini described the use of time scheduled radio in the Cook Islands for the exchange of information by various government departments such as health, agriculture, etc. While service provided for an adequate exchange, (for example all doctors discuss medical problems at a certain hour each day), the problem remains that the time scheduled use of the system makes emergency use difficult and draws personnel away from work at times that are inappropriate.

9. The need for a possible conferencing system that could be called upon for such exchange by government departments was noted by the participants. It was noted that unlike terrestrial links satellite systems provide a solution that is insensitive to distances.

10. Mr. Apis emphasized the need to improve communication between villages, outer islands and centers. The cost of setting up facilities for rural

communication may be too great for some countries, he said.

11. The meeting then discussed the fact that the cost of setting up satellite systems might in some cases be lower. Dr. Toua stated that Papua New Guinea may be able to use a segment of the Australian system but wondered if some isolated areas might still be unreachable.

He stated that the current means of reaching some isolated areas is by trawlers or small boats and that these means are subject to interference from weather. One island in Papua New Guina, Dr. Toua described has a population of about 64 people whose only health care currently is one medical dresser.

When the health aid must go by trawler to pick up supplies, the island can be left for as much as three months without a medical person. Other human services problems were described by Dr. Mataitoga who stated that there is a great need for communication both within the nation and in the region during such emergencies as epidemics.

12. Mr. Apis noted that the meeting had addressed the problems of dealing with scattered, thinly populated outer island areas. He stated that this problem is very severe in the Federated States of Micronesia since in many cases the only means of communication is by field trip ship. An emergency call might come in from one end of the outer islands while a ship was servicing the opposite group. Thus, ships might not reach a patient in time to save a life. He stated that FSM has no urban area whatever and that 80 to 90 percent of the school population is outside district centers. Communications for school purposes is a serious problem.

13. Captain Joy began a discussion of emergency services by describing the present use of shipping and aircraft in Fiji for emergency purposes. Dr. Mataitoga continued that there is a great need for communication services for emergency purposes. Normal communication for emergency service is made through the Ministry of Health. Centrally located doctors must then determine the seriousness of the emergency and the measures to be taken, whether they be immediate evacuation or local hospitalization. If evacuation is required, communication must be made with available ships through the Director of Marine. The Director then must discover if ships are operating near that island and must attempt to contact them so that they can be diverted to pick up patients. Emergency evacuation by helicopter is possible, he said. All of this coordination, he stated, required telecommunication capability.

14. The meeting then noted that rural people are generally regarded as underprivileged because they do not contribute significantly to the national economy. Services are generally concentrated in urban areas. But while government services provided to rural areas are sometimes expensive, the expensive services are not necessarily used at all times by people in the rural areas. They are not such a drain on resources as is sometimes imagined.

15. Dr. Toua emphasized that the problems of development are interrelated and that communication without a transportation system is not useful in an emergency. Mr. Vini provided an apt illustration from the Cook Islands, Rarotonga, the capital is over 100 miles from the nearest island and well over 700 miles south of the farthest. There are differences in ethnicity,

in some cases language, and handling of administrative matters is extremely difficult.

16. Mr. Pakoa continued to discuss the problem of provision of adequate services in rural areas, noting that in Vanuatu recognizing that rural Efate has no adequate maternity centers, a new center has been opened across the island from Port Vila. Women, therefore, no longer have to come into Port Vila for childbirth.

17. Mr. Pakoa commented also on the importance of proper training for the use of telecommunication technology and noted in Vanuatu four ships were lost in one year because ship captains did not know how to use radios properly. He suggested that the lack of proper and adequate schooling in scientific subjects is an underlying problem in technical training.

18. The meeting reiterated that all development issues--shipping, transportation, roads, training and telecommunications, etc. are interrelated. In summary, the meeting chairman noted that education and training are an underlying problem for the utilization of human resources, particularly in the development of a suitable telecommunication structure. He referred to the needs raised in the meeting for conferencing capability and for capacity to handle the logistics of emergency situations. He noted that the meeting had clearly articulated the strong relationship between all forms of communication and transportation.

DESCRIPTION OF COMMUNICATION NEEDS

MANAGEMENT OF ECONOMIC RESOURCES

19. Joan Abramson began the session by pointing out the issues of development are interrelated. During site visits the team often heard transportation and communication used synonymously. One doctor in a rural area said that the communication improvement that would help him most would be the straightening of the road. In another rural area the team was told that communication was an outboard motor. And still another community health center felt the need for a telephone to order supplies so as to keep all necessary staff in the center instead of traveling to make arrangements for supplies. Thus, the link between communication and transportation is clearly established; both provide networks for relating to people, marketing, communicating, etc. It was also found that more often than not two trips into the market center were necessary. The first was to place the order or find out what was needed, and return to the village but then a return to the center and then back to the village was also required for completion of the transaction. The fuel cost sometimes for this would be as much as $60 for each roundtrip!

20. Mr. Witherspoon pointed out the correlation of marketing and harvesting in the field of agriculture; it is difficult to coordinate the harvest with the shipping and marketing without an adequate communication system. This is also true in the areas of fisheries, forestry, tourism, and local travel.

21. The meeting noted that field trip ships carry experts in various fields to remote areas, but sometimes upon arriving in a village it was

found that the proper expert was not aboard and neither were the necessary equipment of tools. These circumstances are caused by the lack of communication. Even a simple drop off supplies can be thwarted by lack of ship-to-shore communication. Word on when and where to pick up the supplies may never get to the isolated populations.

22. The meeting discussed the importance of national planning in the importing and exporting of products on an international level for the development of economic self-sufficiency.

23. The problem of scheduling radio contact was discussed. Time schedule radio was inappropriate for field workers as their day's work becomes frustrated by having to be by the radio for contact with their departments at specific times during the day, a problem which could be avoided by the use of telex. Messages could be checked at the end of the day, replies, messages sent in the evening or morning before departure for the field.

24. Dr. Salato emphasized that we were now looking into the biggest problem--that of the rural areas. He said that 60% of the people of the South Pacific live in rural areas and that this meeting must concentrate on producing suggestions and possible solutions to this rural communications problem.

25. Mr. Pakoa stated that we all know the obstacles but how can satellite communications overcome these problems?

26. The panel noted that one method is to look at the entire structure and at development goals. They spoke of the question of number of phones and where they should be placed. Schools and health centers were suggested venues. Absolute cost is another problem. How does the technology get paid for? The capital outlay will have to be found somewhere. Mr. Witherspoon noted that none of us is a satellite salesman, but that satellite maintenance is a more manageable problem than it used to be. Power requirements are more feasible. He reiterated it doesn't matter how remote the village is once the system is in place.

27. Mr. Faumuina stated that besides economical and social issues the role of telecommunications was becoming more important in the Pacific in the international forum. This important point should be included in the report. Also, it was noted that the world has a vast store of information that can be utilized once a system is in place. Access is the vital link for the Pacific.

28. Dr. Mataitoga went on to day that technical experts and social scientis can help guide us on the merits of the various systems, but that we must go back to our governments and gain the confidence of our politicians to make final decisions. It is also important to consult the rural people before making decisions that will affect their lives. He explained that it is important to make a list of priorities of the kinds of services from a system.

29. Dr. Toua, while supporting the belief that good communications is necessary for mangement of economic resources, concurred with Dr. Mataitoga's feelings that such management is primarily the responsibility

of the individual government, and that planning must be done nationally before it can be done regionally.

30. Chairman Salato noted that among the important issues that had emerged, certainly the issue of the availability of funds was a difficult one. He replied that the purpose of the meeting was to solicit information.

31. Dr. Salato asked Captain Joy of Fiji about the current methods of shipping and the concomitant communication problems. Captain Joy explained that shipping had vastly improved and that he doubted if any islands were not served, although some are only served 5 to 6 times a year by the government ships. He added his feeling that the local people would have to be educated,that a trained person must be in the village and that attitudes would have to be changed.

32. It was noted that village participation is desirable. In Vanuatu tower base land is kept clear by land owners who are given a fee for maintenance. Likewise one-third of responsibility for the water supply goes to villages. A vigorous pride and willingness to work has developed. Mr. Tukituki added that some villages pay 1/6 of their local education as well. Whether it could be extended to telecommunications would be up to the villages priorities,--water being the first probable priority. If a system of self-help is initiated it must be economically feasible.

33. The great variations in costs of telecommunications were discussed. A small earth station ($15,000 - $18,000) for telephone service was one possibility.

34. Mr. Faumuina felt that the local people must be involved in the planning stages of any communication systems and that a survey be taken from which a plan might be formed. He reminded the meeting of the UNESCO meeting and paper concerning the impact of technology on the Pacific Nations and suggested that PSSC take a look at it before completing the study. He mentioned both its good and bad aspects.

35. Dr. Toua emphasized that the regional governments must decide on the appropriate technology and that if it is an interim use of the Australian satellite or the INTELSAT satellite we should seek this out. National government would decide on how to develop and provide their own services.

36. Mr. Witherspoon stated that it was inappropriate for an external project to say what a local or regional group should have, but that the point of the study would be to outline options from which government of the regions might choose. The satellite option is only one of many. Mr. Morgan stated a number of possibilities, and that there are possible requirements of this region to the development of a future Australian satellite or it may be preferable to use a satellite designed specifically for this region. He noted that the question of finance remains.

37. Dr. Beck mentioned the need for telecommunications to booster the economy of the country. He illustrated the example of getting cattle shipped to market. The cattle people wait for a call by radio to instruct them when and where to meet the ship. If the man with the cattle does not have the equipment to receive the message he does not get his cattle to market and therefore loses the sale. Then the same is true with fishing,

forestry, etc. There is a need, he said, for telecommunications to be approved and put into place.

38. Dr. Toua resumed the important point of human resources. He related that their system relies on the use of priests, missionaries and other upper level persons to give medical assistance and to be the center for communication needs. This person is a jack of all trades and is trained in many areas. But the problem remains of training locals and then leaving.

39. Ms. Kaurasi felt that leaders need to make sure that someone is posted at the local post office to deliver messages. The post person may also, be the banker in many cases and does not have the time to deliver messages.

40. The Chairman asked Mr. Morgan to clarify the use of existing technology if a satellite were to be made available. Mr. Morgan explained that if a satellite is used, the satellite will serve at the top and that existing equipment would remain in use. It is not elimination of equipment, it is rather reallocation of usage.

41. The Chairman asked for a clarification of the use of the satellite. Mr. Morgan explained the satellite as a repeater in the sky - just a dumb box. The earth station is the send and receive point of the signal. There would be telephone service as well as other services such as telex, warning signals, facsimile, and news service. Mr. Morgan explained that facsimile

is a method of transmitting a copy of a document via voice lines so that a hard copy is produced at the receiving end. He said that the cost of a cheap machine itself was between $600 to $1000 US dollars and that it takes 4 to 6 minutes per page to transmit. An example of the service was that of ships dropping off barges to be taken into port. The custom papers are sent via facsimile ahead of the barge so that all necessary papers are ready for receiving the shipment. The meeting discussed the usefulness of facsimile for medical records, emergency messages, news, etc. Mr. Morgan explained that anything with voice quality, even short wave radio is sufficient for facsimile, as long as there is someone at the other end to operate the machine.

DISCUSSION OF RURAL COMMUNICATION NEEDS

PHILOSOPHY OF NATIONAL DEVELOPMENT

42. Ms. Hurd described the Study's anecdotal approach requiring attention to both the qualitative and quantitative aspects of telecommunications needs. She stated that the task is to describe what the users need and want. The

panel continued by saying that it is difficult to put quantities on what service is needed, but that the technical experts need to know how much is needed before they begin planning a system. Once again the meeting expressed the view that the decisions to be made are national ones. The study requires an overview of requirements expressed by all users, yet the individual governments have the final responsibility for decision about what they want to use.

43. Mr. Davey requested that the meeting as a group explore the answers and list the options. He suggested as guidelines the following questions:

What is needed in each and every outpost?

A telecenter?

A telephone with facsimile capability?

A telephone within easy reach?

A telephone within easy walking distance?

44. Dr. Mataitoga felt that establishing a regional satellite system would bring our leaders closer together to discuss other cooperative efforts.

45. Chairman Salato restated the need for looking at something the meeting could recommend to NASA, SPEC and to the ITU so that they can make a more accurate plan of possible optional systems. He requested that the meeting state what sorts of services are required and how they might be provided.

46. Mr. Pakoa said that the amount of international traffic can be obtained from each country's telecom center, but that the amount of traffic in the rural areas would be harder to determine. Recently his government has decided upon eleven district councils. At the moment communication is by H.F. radio, some owned by government and some by missions.

47. Mr. Apis noted that regional cooperation was essential if countries in the Pacific were to help their rural areas to be developed. In furthering discussion on the essentialness of regional cooperation for rural development Mr. Apis pointed to the example of Pacific shipping and noted that, since the FSM was planning to use dry docking in Fiji its ships might , given proper cooperation and means of communications, service small islands en route to and from Fiji.

48. Captain Joy noted the importance of linking the countries of the Pacific with efficient, regular shipping services and indicated that improved communication services were necessary to achieve such improved shipping. Mr. Pakoa agreed that shipping required better regional cooperation and stated that the area could well use equipment for communication by satellite for this purpose.

49. Beyond agreeing with Mr. Pakoa's and Captain Joy's comments, Dr. Beck stressed the need to improve the flow of information from the rural areas to the centers and provide services to rural people. He emphasized that the group needed to convey the message that there must be some way to provide satellite service for the Pacific. If such service were not

made available by organizations with satellites, he suggested, it would be appropriate for the Pacific Islands to combine efforts to provide their own satellite for regional use.

50. Mr. Apis agreed, and pointed out that the FSM had supported the Forum government's request for a study of rural telecommunication needs in the Pacific. The FSM supported shared use of satellite capacity.

51. Mr. Drumm suggested that one recommendation should be that training be started immediately to provide sufficient personnel of the new technology. He added that training involves the issue of where that training is located. When people are trained in urban centers, he said, they tend to want to remain in those centers. There is often a problem of getting people to return to the countries that paid for their training. He added that expatriates sometimes are seriously involved in training and the transfer of knowledge to local people.

52. The Chairman noted that there is a problem in training people in technical areas and returning them to a country which has a salary system that pays more for administrators than persons with high level technical training.

53. Mr. Pakoa added his agreement to the ideas expressed by earlier speakers. He suggested that a further recommendation must be that any system devised to improve rural telecommunication should be economical and the chosen system, no matter how good, must not cost more than other means of achieving telecommunications.

54. The Chairman then asked the group to make recommendations on the role of women in telecommunication work. It was pointed out that Papua New Guinea has begun accepting women into its P and T Training program and that the women in the program are doing quite well. The group agreed that women could perform well in any field and that training of women should be emphasized.

55. Other training related recommendations came from Mr. Drumm, who suggested that developing countries should not be used as a training ground for the developed countries. He also suggested that developed countries should be asked to put some constraints on the drain of trained persons into the developed world. Dr. Toua pointed out that expatriates in PNG are asked to impart knowledge to counterparts and stated that, in cases where this was not done, contracts are not renewed for expatriates. He said, however, that there were instances where expatriates had in fact used their positions in order to benefit from their own experience at the expense of the people in the developed nation.

56. Mr. Faumuina stated that one of the reasons Pacific nations lose so many good physicians is the absence of modern facilities and technologies. These people want to be where they can refine their skills and are frustrated with the types of facilities at home, compared to facilities where they had trained.

57. He then stated that one conference recommendation should be that the importance of satellite communication systems should be noted so that Pacific nations can bring people back home. They have been lost

because of inadequate facilities in the Pacific.

58. Dr. Beck agreed that part of the problem was that people were trained away from home in far more technologically sophisticated circumstances than were needed or available in the home country. They remain in developed countries because they become frustrated at home and also they can make more money in developed countries.

He agreed with earlier speakers on the issue of expatriates and underscored the point that expatriates are in the Pacific in order to maintain standards where the Pacific nations cannot do so themselves. He noted that one difficulty faced by expatriates is that they are, in fact, required to work themselves slowly out of their jobs.

59. The Chairman at this point asked the meeting to list its recommendations. These recommendations follow:

1. Immediate appropriate training of sufficient numbers of Pacific Island staff to satisfy the requirements of proposed technology. As much as possible this training should take place in the region.
2. Better education of people to more effectively use both the existing systems as well as any new services that might be provided.
3. The whole Pacific must be viewed as a rural area.
4. The countries should support a regional satellite capability.
5. It was recommended that, since the islands of the Pacific are surrounded by sea and their only major resource is the sea such a satellite should provide for specific communication needs such as fisheries, offshore oil and surveillance of

foreign fishing vessels.

6. While the group has decided there should be a satellite capability for the region, the individual nations must not neglect the improvement of existing systems.
7. That the long term objective of improving national service include two-way communication links to tie the rural areas with main centers, not only in outer islands, but also in rugged interior areas.
8. A conferencing system for government leaders and officials to eliminate so many meetings and to provide them with a means of discussing other cooperative developmental efforts, together with simple conference facilities between government centers and rural areas.
9. Improved telecommunication generally is required for improved regular shipping service.
10. Better integration of communications between rural communities and coastal shipping.
11. Provision of warning systems to remote villages in the event of impending disaster, particular tsunamis.
12. Training of women as technicians should be emphasized.
13. Improved communications from rural areas to the centers.
14. That any system proposed not be more expensive finally than other means of supplying communications.

The Chairman then suggested the meeting be brought to an end with the group consensus on the recommendations. Thanks were expressed to staff, participants and the Chairman.

ANNEX 1

Welcoming remarks of Mr. Ikipa Tongatule for the
South Pacific Bureau for Economic Cooperation

Honorable Minister
Vice President of PSSC
Distinguished Delegates
Ladies and Gentlemen:

Firstly, I would like to convey the sincere regrets of the Director of SPEC for not being able to personally attend this meeting and on his behalf I extend to you a most warm welcome to the SPEC Headquarters. I would like to express our gratitude to the Public Service Satellite Consortium for giving us this opportunity to welcome all the distinguished delegates as well as allowing our participation in this meeting. SPEC will be observing your deliberations very closely and look forward to the final outcome. We have noted the special emphasis given by the PSSC to the Users of telecommunication in its work and we in SPEC view this as complementing our efforts in the same field.

It is perhaps appropriate to recall that at the 1973 Apia Forum it was resolved that "the provision of an adequate telecommunications network in the region was essential. In view of the work already being undertaken under UN Agencies and other auspices it was decided that SPEC should act as the co-ordinating agency. It should also work to ensure that the plans of member Governments in this area were executed in a manner compatible with the regional interest."

ANNEX 1 (2)

In performing this role SPEC convened meetings in 1973 to discuss national developments and review regional UNDP Projects being undertaken in the region. Since then, annual meetings have been held for the South Pacific countries and international bodies involved in these projects.

Currently, SPEC co-ordinates two UNDP projects on training and upgrading of telecommunications facilities. In this regard regular contacts are maintained with the project offices based in Suva and by convening annual meetings to review their progress. In addition, SPEC is a convenor of the study of the South Pacific National Telecommunications needs which was requested by the South Pacific National Telecommunications meeting held in Suva in November 1980. Preparations for this Study are well underway.

Finally, SPEC takes this opportunity to wish the PSSC and all delegates a successful meeting and special thanks are extended to you Mr. Minister for your attendance at this opening.

Thank you.

Suva, June 24, 1981

ANNEX 2

Remarks by Dr. Louis A. Bransford, Vice President
Public Service Satellite Consortium

Ladies and Gentlemen,

I am honored and delighted to have the opportunity to represent the Public Service Satellite Consortium and to participate with you in discussing the Pacific Basin Communications Study -- a study of rural telecommunication needs in the island region.

I bring greetings from the Chairman of the Board of Directors and the President of the Consortium.

PSSC has had an on-going involvement in the Pacific for several years. Our interest is reflected in a number of activities. The University of the South Pacific, the University of Guam, the University of Hawaii and the Australian National University are all PSSC members. We have worked with ATS - 1 and 6 and are currently involved with the Department of the Interior Satellite project, a network which connects the Micronesian entities with each other and the outside. We have also provided technical consultation to USP. And, we have undertaken the present study which is funded jointly by NASA and the Department of Commerce, two U.S. government agencies with interest in assisting Pacific nations in improving communications services.

The focus of the Pacific Basin Communication Study is threefold:
The mission is to determine:

What exists
What is needed

ANNEX 2 (2)

What is the appropriate technology to meet these needs. Today, you will hear background on how this study came about and what is being done to date.

The focus of this meeting is threefold:

I: First, to review the field work completed to date.

II: Second, to discuss at greater length the ways in which human development, economic development and national identity are affected by the condition of communication in the island states.

III: Third, to present an outline of possible technical and organizational alternatives which may meet the needs previously identified.

We ask you then to review our data, comment on its accuracy and to supplement it with information from your own personal, traditional and professional experience.

The tremendous amount of information on the Pacific Basin compiled during the study enables us to talk with some degree of confidence about user needs and technical requirements.

Some questions remain to be answered. What options are available to finance improved telecommunications in the Pacific? What is the ability and willingness to pay for improved telecommunication services? Is aggregation or a partnership relationship feasible and what are the trade-offs for the different partners?

ANNEX 2 (3)

But before these issues can be addressed we need to make sure that the information we have on user needs is comprehensive and accurate.

We solicit from you who know, assistance to ensure that what we say is what you said.

We look forward to a meaningful and productive meeting.

Thank you for coming.

Suva, June 24, 1981

ANNEX 3

OPENING ADDRESS BY THE HON. LIVAI NASILIVATA,
MINISTER FOR WORKS AND COMMUNICATIONS
AT THE OPENING OF THE
PUBLIC SERVICE SATELLITE CONSORTIUM
USERS' CONFERENCE
SPEC, JUNE 24, 1981

Mr. Chairman, distinguished guests, ladies and gentlemen,

I am happy to address you this morning at the opening of your meeting to discuss and deliberate on your needs for communications in the rural areas of our island nations.

This meeting, I understand, is unique for several reasons. Firstly, it is a meeting which brings together people from a wide range of positions and professional responsibilities. Instead of doctors talking only to doctors, and engineers discussing engineering problems exclusively between themselves, at this meeting the problems of telecommunications will be discussed by people who should know most about them--the people who try to use the systems: doctors, engineers, planners and educators alike.

The meeting is also unusual in that it focuses the important inputs of Pacific Islands rural development onto one of its major stumbling blocks, inadequate communications. Our national objectives for rural health cannot be achieved solely by increasing our national budget to the health department. Our agricultural problems will not be solved simply by growing more food. Better education for the rural dwellers cannot be achieved solely by building more schools and handicraft centers in the rural areas. A system of constant monitoring

ANNEX 3 (2)

and feed-back of development progress in the rural areas is a necessity to achieve our national objectives.

Although the sizes of our island countries are relatively small the scattering of our island territories over a wide ocean span and the relatively rugged terrain of our rural areas is a hindrance to our social and economic growth. The meeting looks to you to consider the many aspects of rural development in the context of how telecommunication fits in to achieve our national objectives for the rural areas.

I would like to address myself briefly to the Pacific country participants at this meeting. I do have to reiterate to you the importance of rural development in your countries. Our leaders have stressed its importance and priority often and adequately. Each of you is also personally involved in at least one aspect of rural development in your daily responsibilities. What I do wish to say, however, is that you, the people with the direct responsibility for development in rural areas, need to provide this study with full and accurate information of what your needs are to achieve these goals. I am told that there is a saying in the computer industry: "rubbish in, rubbish out." You can't get output that is good unless the input is equally good. I want to stress therefore that the basic evidence on which this important study is based must come from you. We in the Pacific tend not to be outspoken on many issues. At this meeting you will be serving your countries by discussing freely and frankly your problems and your needs within your respective fields of responsibility.

ANNEX 3 (3)

Many of you present here may hold the view that the telecommunications administrations of the region are doing little or nothing in the field of rural communications but this is far from the truth. A great deal is being done but I would be among the first to admit that it is not enough. Unfortunately, we have to contend with the basic economic facts of life. Rural dwellers generally have a very low per capita income and therefore communications services in rural areas tend to be uneconomic. At the same time, for reasons of geography and local topography, the provision of rural communications facilities is inevitably the most costly part of the national network and the resources available to us are very limited.

Several years ago the ITU initiated a study of communications needs and facilities, or rather lack of facilities. The fruits of that study were slow in materializing and spread far too thinly over the South Pacific Region to make an effective contribution to the upgrading of the telecommunication network. Fortunately the studies resulted in stimulating Government's and private enterprise, in some cases jointly, into helping themselves as witnessed by the recent mushrooming of the B earth stations in many of the small countries of the Region. The introduction of the new technologies represent heavy capital investment and expensive maintenance commitments by many governments. It is therefore imperative that these new systems be utilized to the maximum by "users" and this calls for the establishment of good rapport between the "users" and the "providers", which unfortunately, from my observation, is sadly lacking.

ANNEX 3 (4)

For without full utilization of existing systems governments will have no choice but to resort to subsidy and this can only mean that the cost of operating their internal and external systems must be passed on to non-users as well.

What I have just said does not mean that the existing systems, representing as they do considerable improvements in a relatively short period, are adequate for the demands of the future, particularly in the rural sector.

In recognition of this fact the Telecommunications Administrations of the South Pacific last year met with Australian Government representatives and discussed the possibility of their rural communication needs being incorporated in the proposed Australian Domestic Satellite program. The response I am pleased to say, was favorable and a three-man team of experts, drawn from Australia and New Zealand, is soon to make an assessment of the needs shortly.

The entry of Public Service Satellite Consortium in this field introduces, perhaps, an element of competition and may the best man win! But seriously, I trust the two studies can be married together and an integrated and viable solution found.

I cannot anticipate the outcome of this meeting and I do not suggest any conclusions for your efforts. I do however wish you all a very

pleasant stay in Fiji and I wish this meeting every success in furthering our efforts to improve rural telecommunication. It is with great pleasure that I declare this meeting open.

ANNEX 4

PACIFIC BASIN COMMUNICATION STUDY
SPEC/PSSC USERS' MEETING

Participants' List:

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OBSERVERS:

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New Zealand High Commission

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ANNEX 4 (4)

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Economic Data for Forum Countries [1]

COOK ISLANDS

Total Government Expenditure:	US$ 16.7m
	$899 per capita
Gross Domestic Product:	$20m GDP market prices (SPC stat.) $1,082 per capita
Overseas Assistance:	Bilateral: $7.3m
	Multilateral: $7.6m
	From Australia, New Zealand, United Nations Development Program, United Kingdom. New Zealand subsidizes 50% of the annual budget.
Imports:	Total: $23m
	Food imports per capita: $225
Main suppliers:	New Zealand, Japan, Hong Kong, United Kingdom, Australia.
Exports:	$3.9m
Main markets:	New Zealand and Australia

[1] Unless otherwise noted, all statistics are 1979 figures from "Coping with Crisis: Disaster Preparedness and Rehabilitation the Pacific Way," a project of the East-West Center Center Pacific Islands Development Program, Angela Franco and Dr. Michael Hamnett, investigators, with assistance from the Office of U.S. Foreign Disaster Assistance, U.S. Agency for International Development, in preparation, 1981. All figures are presented in estimated U.S. dollars. Details are presented for all Forum countries except Australia and New Zealand.

FIJI

Total Government Expenditure:	$296m $414 per capita
Gross National Product:	$1,009m at market prices $1,629
Overseas Assistance:	
Bilateral Multilateral	$25,8m 31.2m from Australia, New Zealand, Britain, United Nations Development Program, European Economic Community, Asian Development Bank.
Imports:	Food Imports per capita: $114
Main Suppliers:	Australia, Japan, United Kingdom and New Zealand.
Exports:	$258.9m Mainly sugar, coconut oil, gold.
Main markets:	United Kingdom, Australia, New Zealand, U.S.A., Canada.

KIRIBATI

Total Government Expenditure:	$15.5 m $270 per capita
Gross Domestic Product:	$37m market price 647 per capita
Overseas Assistance:	
Bilateral	$8.8m
Multilateral	$8.9m
Sources:	United Kingdom, Australia, New Zealand, Asian Development Bank, United Nations Development Program.
Imports:	$17.4m Mainly food, fuel, manufactured goods
	Food imports per capita: $77
Main Suppliers:	Australia, United Kingdom, Japan, Fiji, New Zealand, Singapore, Hong Kong.
Exports:	$23.7m
Main markets:	Australia, New Zealand, United Kingdom

NAURU

Total Government Expenditure:	Not available
Gross Domestic Product :	$28,750 per capita 1978?
Overseas Assistance :	Not needed
Imports :	$11.9m
	Mainly lumber, building materials, foodstuffs vehicles.
Main Suppliers:	Australia, United Kingdom, New Zealand, Hong Kong
Exports:	$75.4m
Main Markets:	Australia, New Zealand, Japan

NIUE

Total Government Expenditure:	$3.7m $1,023 per capita
Gross Domestic Product :	$3m (producer prices for monetary sector only) $867 per capita
Overseas Assistance: Bilateral Multilateral	 $4.8m 4.9m Budget 71% subsidized by New Zealand in 1978.
Imports:	$2m Mainly food, manufactured goods, machinery. Food imports per capita $192 (1978)
Main Suppliers :	New Zealand, Japan, Singapore, Fiji and Australia.
Exports :	$383,000 Mainly copra, passion fruit and handicrafts.
Main markets :	New Zealand, Britain, Australia.

PAPUA NEW GUINEA[1/]

Total Government Expenditure:	$618.1m $597 per capita
Gross Domestic Product:	$1.78 billion $587 per capita
Overseas Assistance:	
Bilateral	$274.4m 269.4m Australian and for five years starting in 1976 (untied budget support)
Multilateral	$2,838 in 1979.
Sources	Australia, New Zealand, United Kingdom, Asian Development Bank, United Nations Development Program and Canada.
Imports:	$786m equipment, machinery cereals, meat, foodstuffs.
Main Suppliers:	Australia, Japan, USA, Britain, Hong Kong.
Exports :	$961.6m Mainly coffee, cocoa, copra, copper ore and concentrate timber.
Main markets :	Australia, Japan, Britain, USA, West Germany.

1/ All figures for Papua New Guinea, unless otherwise noted, are for 1978.

SOLOMON ISLANDS

Total Government Expenditure:	$43.6m $199 per capita
Gross Domestic Product:	$130.7m at market prices $600 per capita
Overseas Assistance:	
Bilateral	$23m
Multilateral	$26,7m Britain financed 15% of the recurrent budget and 98% of the capital budget. Assistance also from Australia, the United States.
Imports:	$59m mostly foodstuffs, oil and manufactured goods. Good imports per capita $23
Main Suppliers:	Australia,Japan, Britain, Singapore.
Exports:	$70.2m mainly fish, copra timber
Main markets:	Japan, Australia, Germany, United Kingdom, New Zealand, Papua New Guinea.

KINGDOM OF TONGA

Total Government Expenditure:	$18m $190 per capita
Gross Domestic Product:	$42.7m at factor cost $446 per capita
Overseas Assistance:	
Bilateral	$20.4m
Multilateral	$23.5
Sources	Britain, Australia, New Zealand USA, Asian Development Bank, European Economic Community, United Nations Development Program, West Germany, Taiwan.
Imports:	$29.3m mainly food and manufactured goods. Food imports per capita: $75 (1978)
Main Suppliers:	New Zealand, Australia, Fiji, Britain and Japan.
Exports:	$7.7m 80% coconuts; also bananas
Main markets:	The Netherlands, New Zealand and Australia.

TUVALU

Total Government Expenditure:	$2.1m $291 per capita $4m at market prices
Gross Domestic Product:	$564 per capita
Overseas Assistance;	
Bilateral	$4m
Multilateral	$4.5
Sources	Australia, Britain, New Zealand, European Economic Community, United Nations Development Program.
Imports:	$2.1m mainly foodstuffs and manufactured goods.
Main Suppliers:	Australia, Fiji, New Zealand
Exports:	$287,840 mainly copra
Main markets:	Britain

VANUATU

Total Government Expenditures:	$51.9m (1978) $512 per capita
Gross National Product:	$50m (1977) $520 per capita
Overseas assistance:	
Bilateral	$37.7m
Multilateral	$38m
Sources	Britain, France, Australia, New Zealand, United Nations Development Program
Imports:	$62.2m
Main Suppleirs:	Australia, France,Japan, New Zealand.
Exports:	$41.4m mainly copra, coffee, cocoa, frozen fish.
Main Markets:	France, USA,Japan

WESTERN SAMOA

Total Government Expenditure:	$50.9m (1978) $331 per capita
Gross Domestic Product:	$60.3m (1978 producer prices) $394 per capita
Overseas Assistance;	
Bilateral	$20.7m
Multilateral	$30m
Sources	Australia, New Zealand, Britain, Asian Development Bank, European Economic Community.
Imports:	$74.9m mainly equipment,machineries, consumer goods and manufactured products. Food imports per capita $75 (1978)
Main Suppliers:	Britain, Australia,Japan, Canada
Exports:	$18.5m
Main Markets:	New Zealand, Britain, USA, Australia, Canada.

Techniques Used In the Study

Before the field team left for the Pacific, a conference was held and a list of desirable telecommunications information was provided to the team. The collected data was later analyzed and used in the selection of the engineering options.

While this data was being collected, traditional methods of estimating the traffic demand were being studied and employed. Table D.1 is a list of nations. These numbers refer to the following three figures (Figures D.1 through D.3). Figure D.1 shows the plot of the number of telephones per capita versus the GNP per capita in 1975.

In Figure D.2 data from NASA Technical Memorandum 91586 uses demographic data for 1976-77. This data is plotted using an X. The new slope (the dash line) is plotted. The difference between the two slopes is primarily inflation and growth.

Figure D.3 is from the same report but is based on 1977 data for South America.

If inflation were the only factor, the solid line would be translated vertically. If there were no inflation and a continued growth in telecommunication services, the solid line would be translated to the right. The dash line indicates that a combination of these two factors is at play. It suggests that the growth of telecommunication services is more rapid in developing nations than in the more developed areas of the world.

When the results of the field visitations became available it was obvious that there was a substantial scatter in the data and

simplistic models, such as the previous one, and the traditional North American, European and CCITT (the Telephone and Telegraph Committee of the International Telecommunications Union) methods would not fit.

Figure D.4 shows what happened when the data for four basic island groups (Fiji, the Cooks, Kiribati and the Solomons) was plotted. The test here was to determine if the number of telephones was greater in the metropolitan areas than in the rural districts. From the data any particular proposition could be proved or disproved. This is an example of the wide diversity in the development of the telecommunication facilities even within a single island group. For this reason it is hazardous and unfair to try to generalize the results of this very detailed field study.

Another example of the attempt to build models is shown in Figure D.5. In this case an attempt was made to relate the number of telephones to the number of radio receivers. Again a substantial scatter in data is noticed and it seems to make little difference if the island group has an INTELSAT or submarine cable system.

It was also noted that there is a great asymmetry in the flow of traffic within the Pacific islands. Slightly over thirty per cent flows from one rim (metro) nation to another. An example of this would be traffic from Australia to New Zealand or Australia to the United States. (See Figure D.6).

Communications between the rim and island nations represent approximately two thirds of the total traffic. There is a great asymmetry, however: approximately five times as many telephone calls

are placed from a rim nation to an island nation as those that go in the other direction. There are several reasons for this. One has to do with relative economic status. Another is that the poorer island nations have lost population to the rim and the immigrants have called back to their home islands.

Traffic between the island nations stands at a remarkably small 3.4%. Some island to island traffic transits a rim nation or could be in one of the other categories (see above).

Figure D.7 provides a possible explanation of this flow. For this particular example, traffic between Japan and Fiji has been selected. It was later discovered that, when looking at the actual traffic flow between these two nations, the asymmetry matches that which would be predicted by Figure D.7. This is one isolated case and would need to be developed further before it could be used as a model.

The maritime satellite system, MARISAT, has completely upset the traditional flow of traffic between ships and shore. High frequency (HF) morse code traffic is almost entirely from shore to ship with only brief responses going in the other direction. In part this is due to the great difficulty in making contact with a ship at sea using the HF radio service. The MARISAT service provides instant communications. The conventional HF morse code has been replaced by telex and voice. In both these services there is substantially more traffic flowing from the ships to the shore than in the other direction. In very recent years traffic between ships has started to appear. The MARISAT is an example of the hazard of using

traditional traffic flow and volumes in predicting the requirements of a new service. The same hazard is present in the Pacific in trying to use the minuscule amounts of present day traffic data to project into the late 80's and 90's. (See Figure D.8).

It was observed that some telecommunications in the Pacific tend to follow cultural regions as shown in Figure D.9.

An attempt was also made to configure national and international networks along the lines that are laid down by the CCITT. Figure D.10 shows a conventional traffic network. The numbers and CT values relate to the CCITT switching hierarchy. Figure D.11 shows a hypothetical inter-island group communications scheme. In reality many of the islands and island nations are too small to support a complete hierarchy and therefore several levels in the international and local class of stations are co-located in a single exchange. Here again the traditional forms of traffic measurement and flow break down.

Table D.1 - List of Nations

1 - World Average
2 - Burma
3 - Indonesia
4 - India
5 - Nigeria
6 - Sudan
7 - Ethiopia
8 - Angola
9 - Thailand
10 - Morocco
11 - Philippines
12 - Egypt
13 - Syria
14 - Saudi Arabia
15 - Libya
16 - Cuba
17 - Taiwan
18 - Brazil
19 - South Korea
20 - Mexico
21 - South Africa
22 - Argentina
23 - Venezuela
24 - USSR
25 - Ireland
26 - Italy
27 - Czeckoslovakia
28 - Israel
29 - France
30 - West Germany
31 - United Kingdon
32 - Japan
33 - Australia
34 - Canada
35 - Sweden
36 - USA

50 - Fiji
51 - Solomon Islands
52 - Western Samoa
53 - French Polynesia
54 - New Caledonia
55 - Tonga

60 - Pacific Islands
61 - Vanuatu
62 - Cook Islands

70 - Chile
71 - Columbia
72 - Peru
73 - Ecuador
74 - Bolivia
75 - Uraguay
76 - Paraguay
77 - Guyana
78 - Suriname

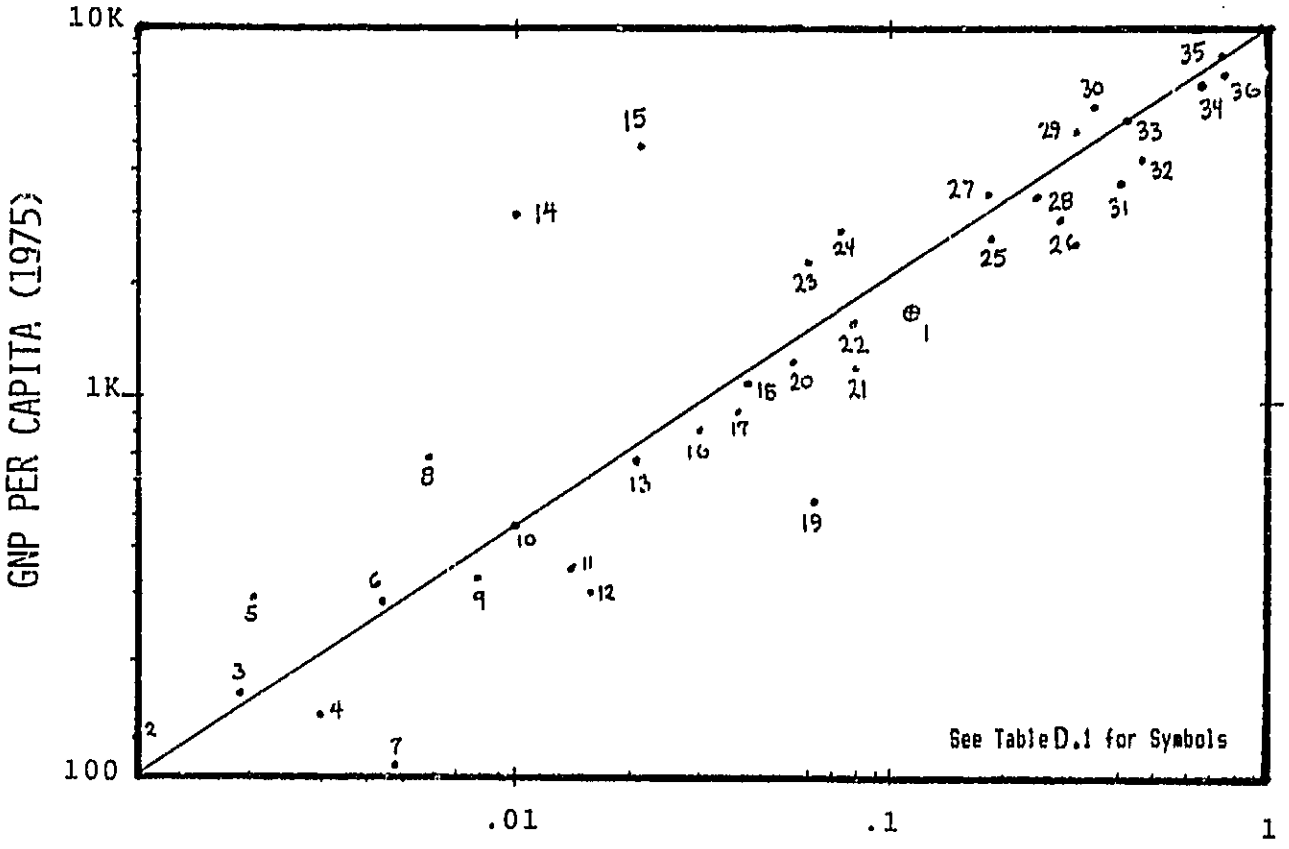


Figure D.1 – Telephones per Capita (1975)

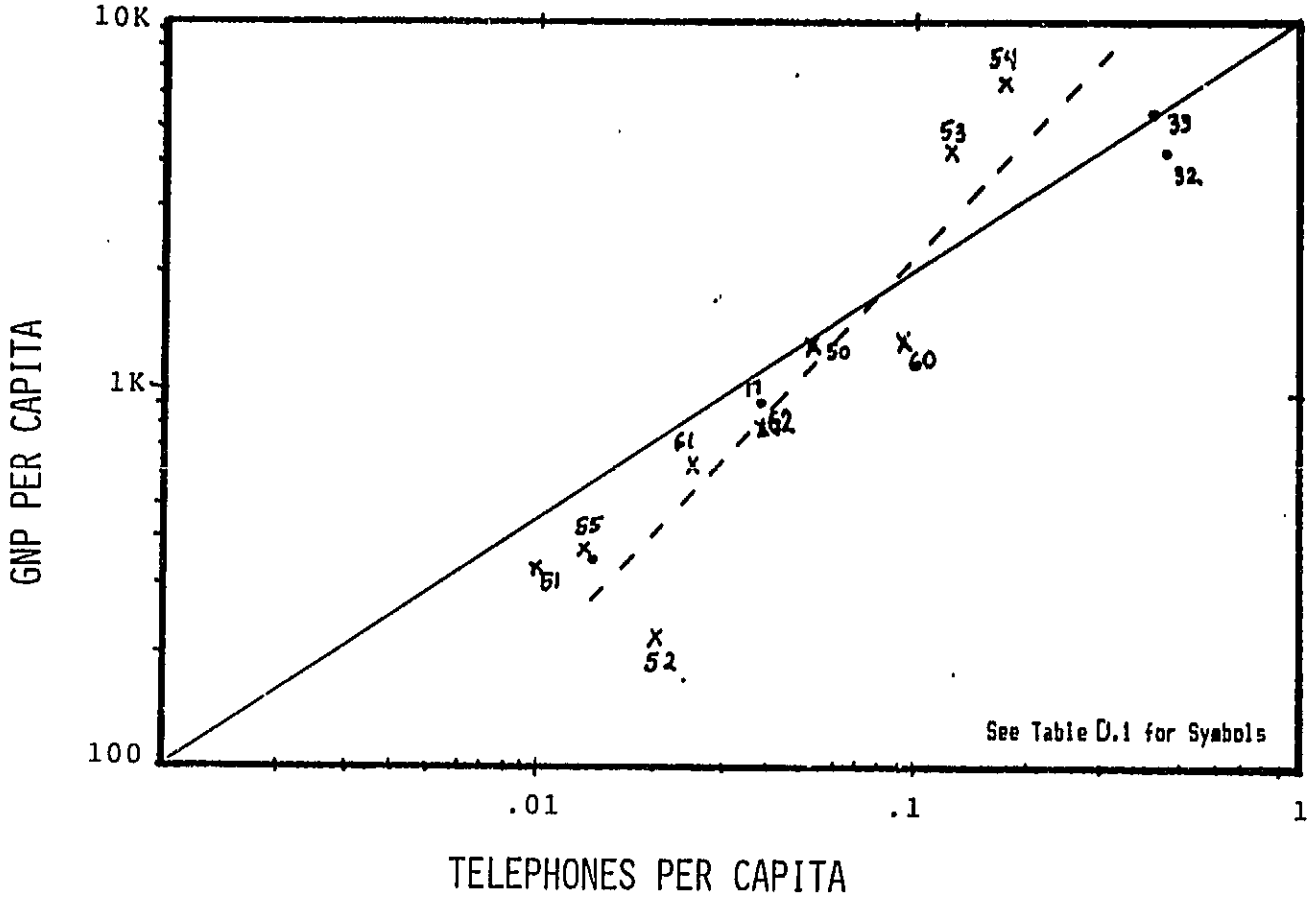


Figure D.2 – NASA Data (1976-77)

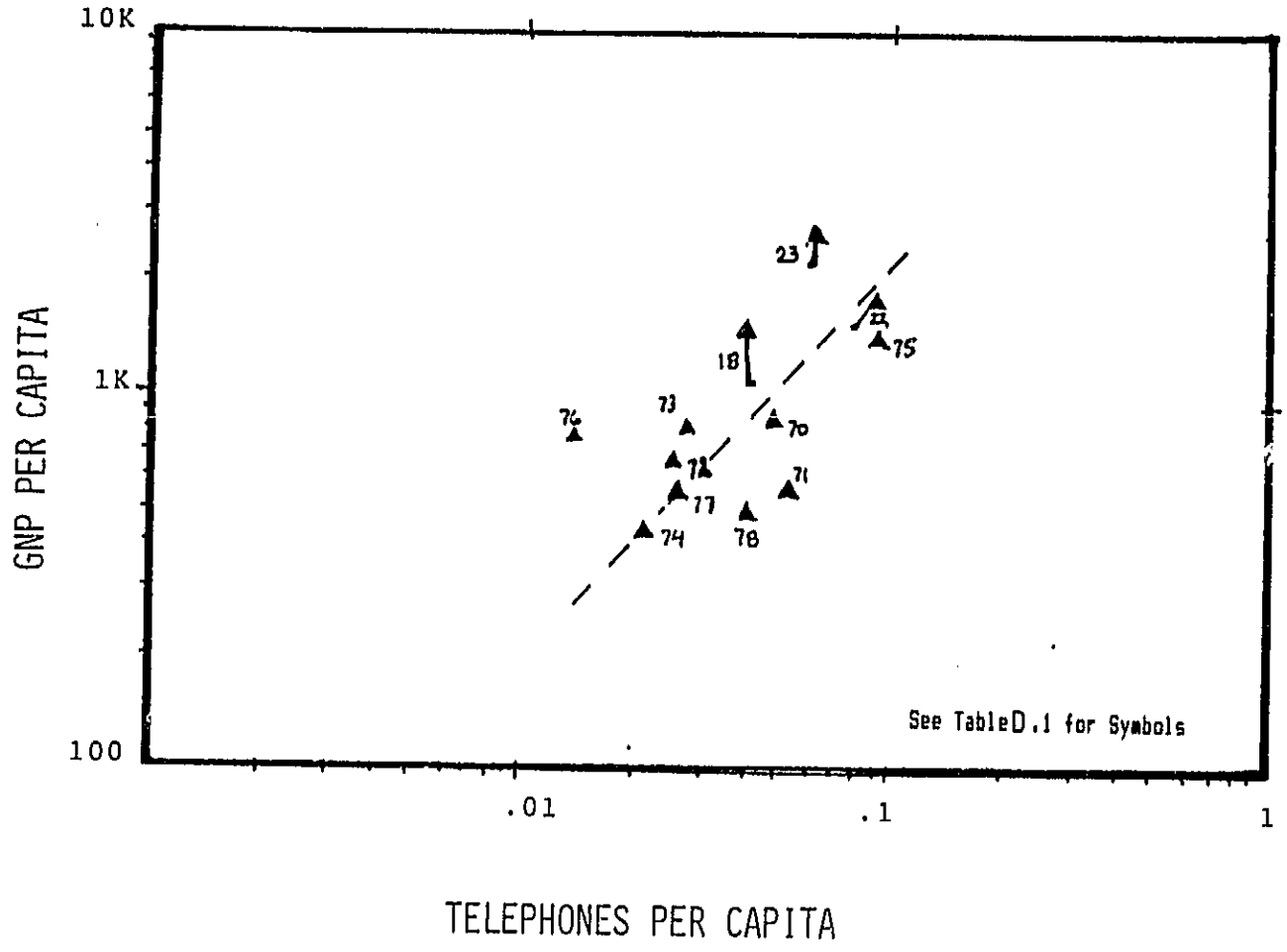


Figure D.3 - South American Telephones

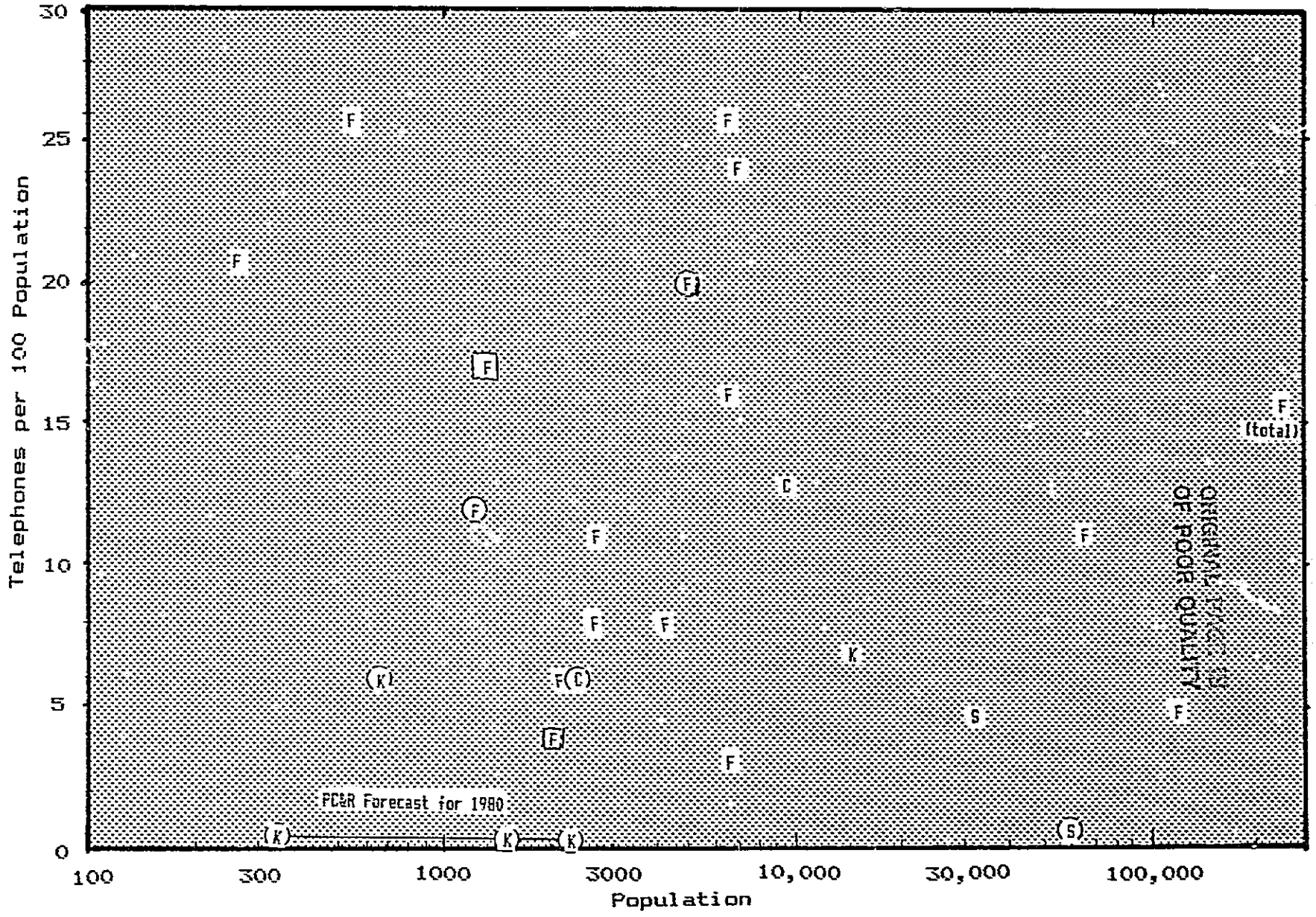


Figure D.4 -- Distribution of Telephones

C = Cook/Rarotonga (C)= Cook/Arutanga F =Fiji/Viti Levu (F)= Fiji/Vanua Levu [F]= Fiji/other K = Kiribati/S.Tarawa (K)= Kiribati/other

S = Solomon Islands/Honiara (S)Solomon Islands/Gizo & Anki

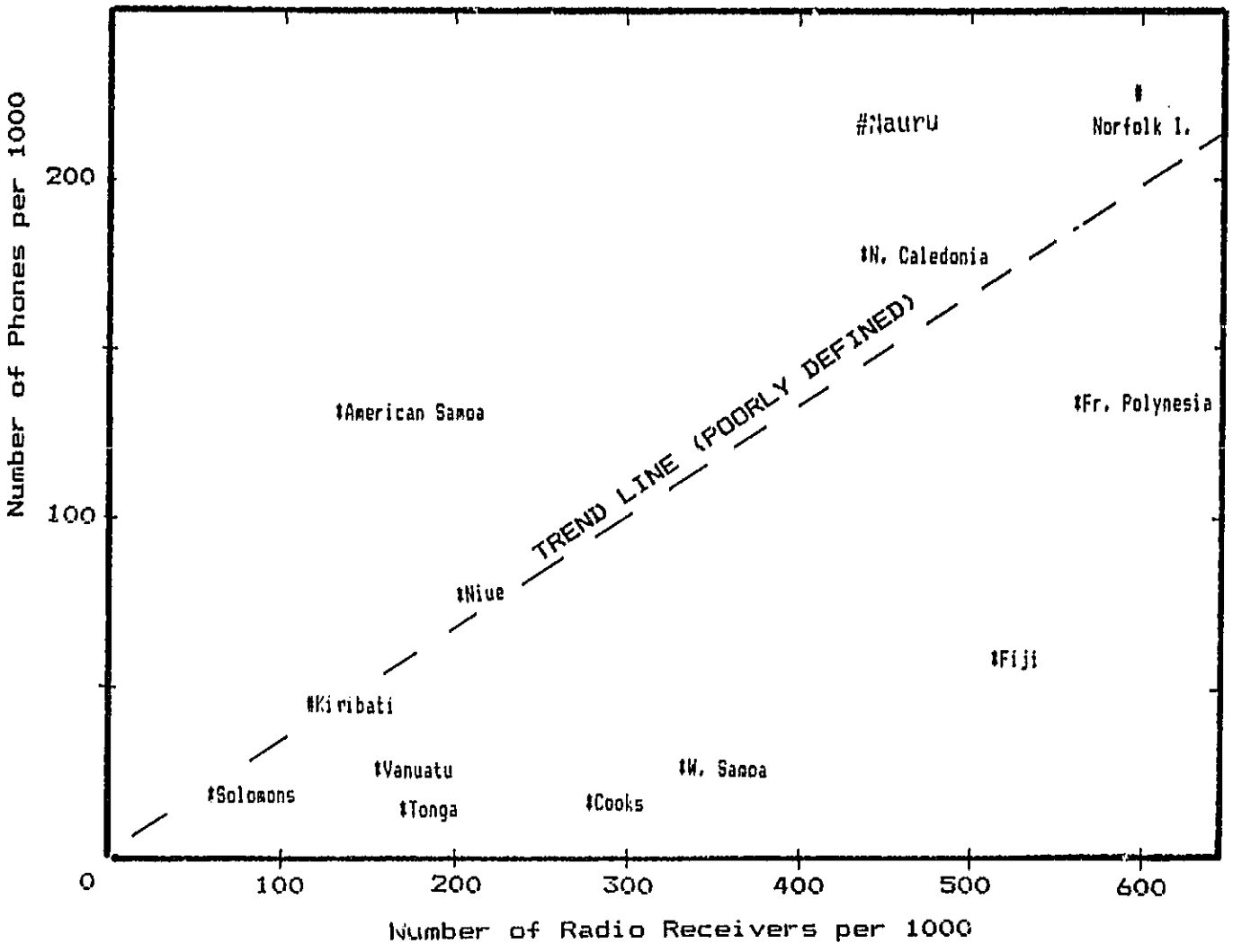
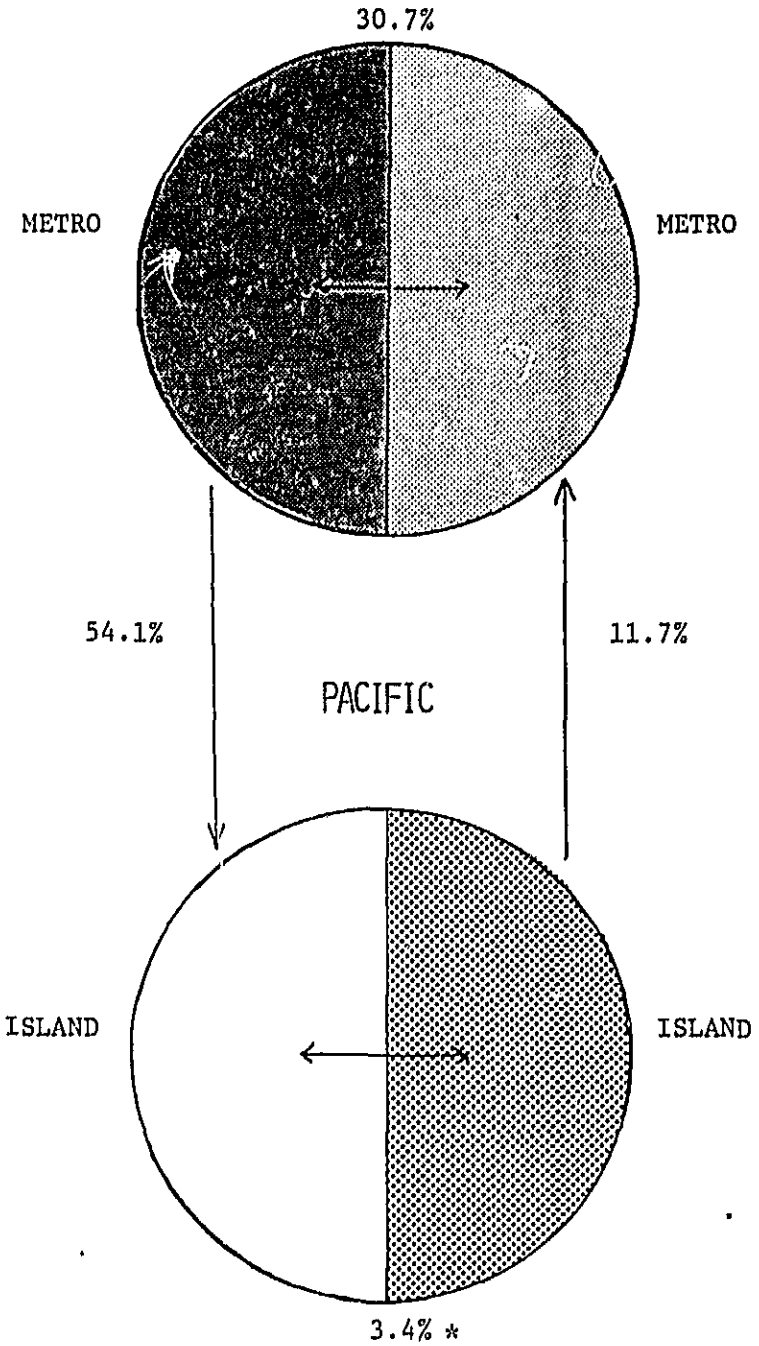


Figure D.5 - Telephones and Radios

* Have INTELSAT and/or Cable Stations



* Some island nation to island nation traffic is via a metro (or rim) nation (and thus appears in the vertical links)

Figure D.6 – Assymetic Traffic Flow

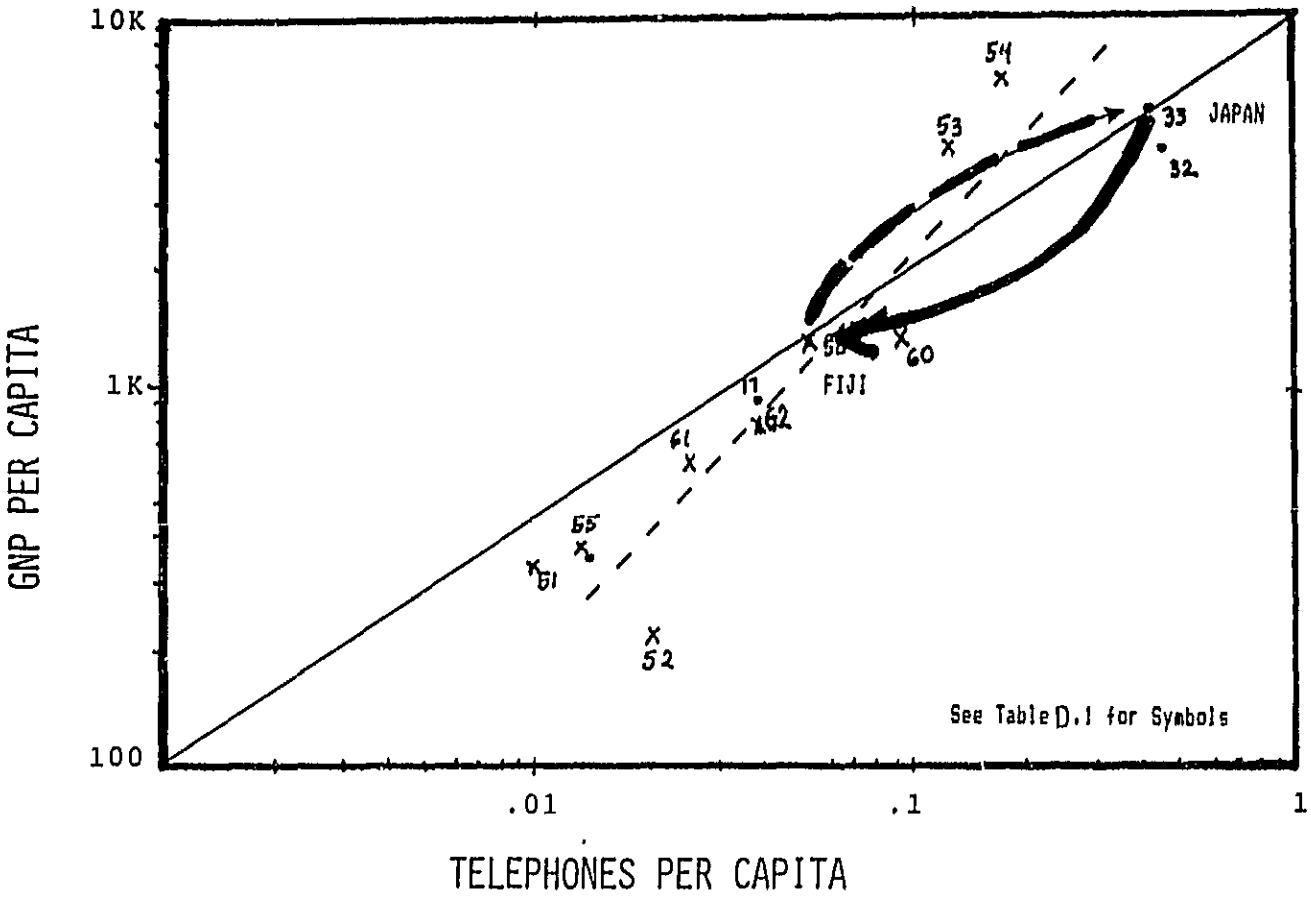


Figure D.7 - Traffic Flow

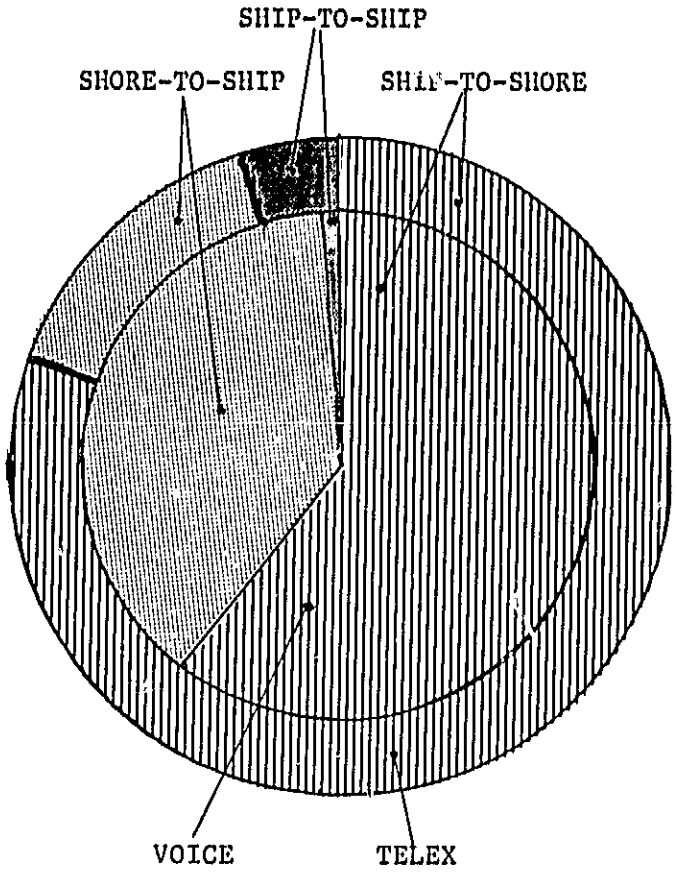
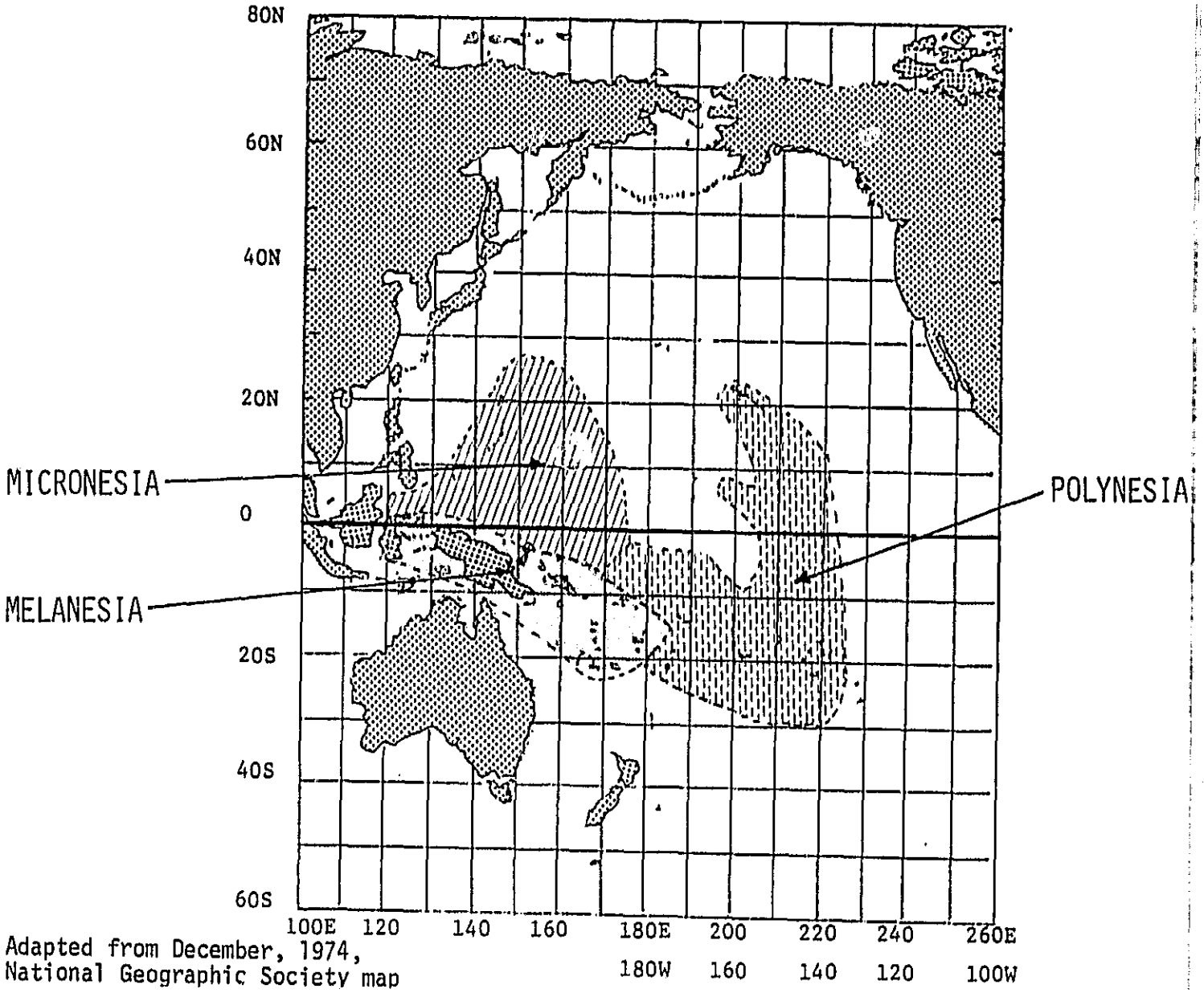


Figure D.8 - MARISAT Traffic Quantities



Adapted from December, 1974,
National Geographic Society map

*(The indigenous Maroi population of NZ is also Polynesian.)

Figure D.9 - Cultural Regions in the Pacific

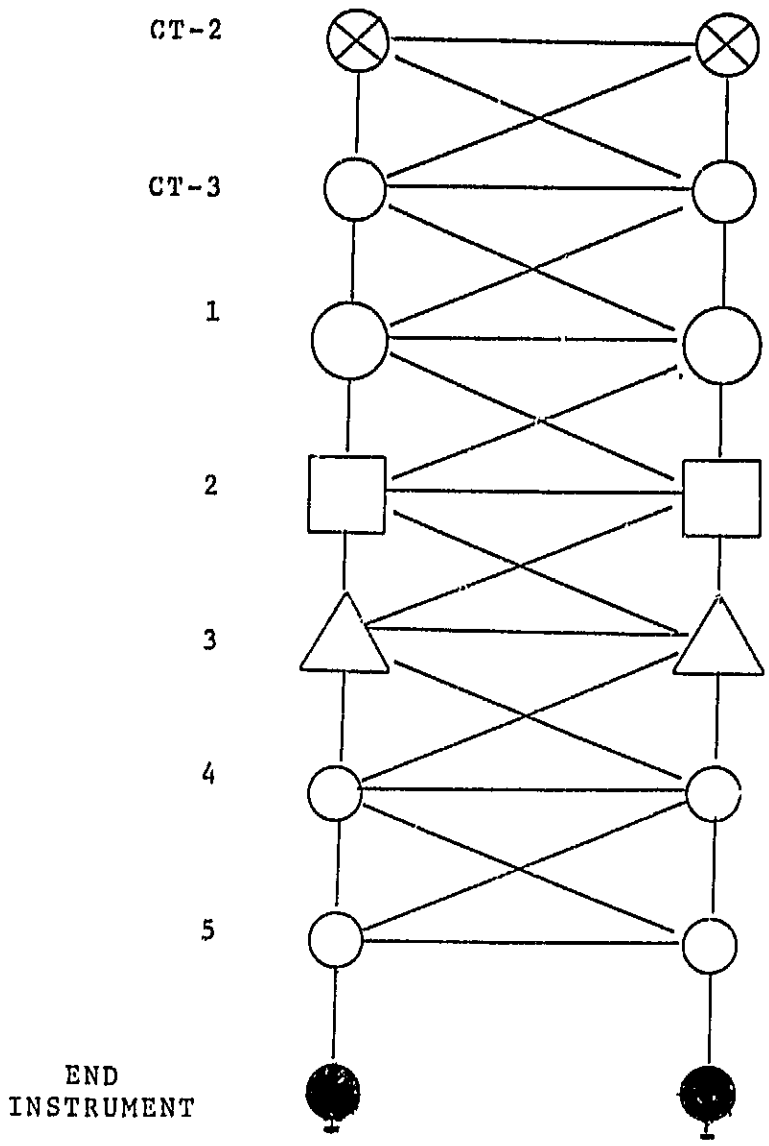


Figure D.10 - Conventional Traffic Network

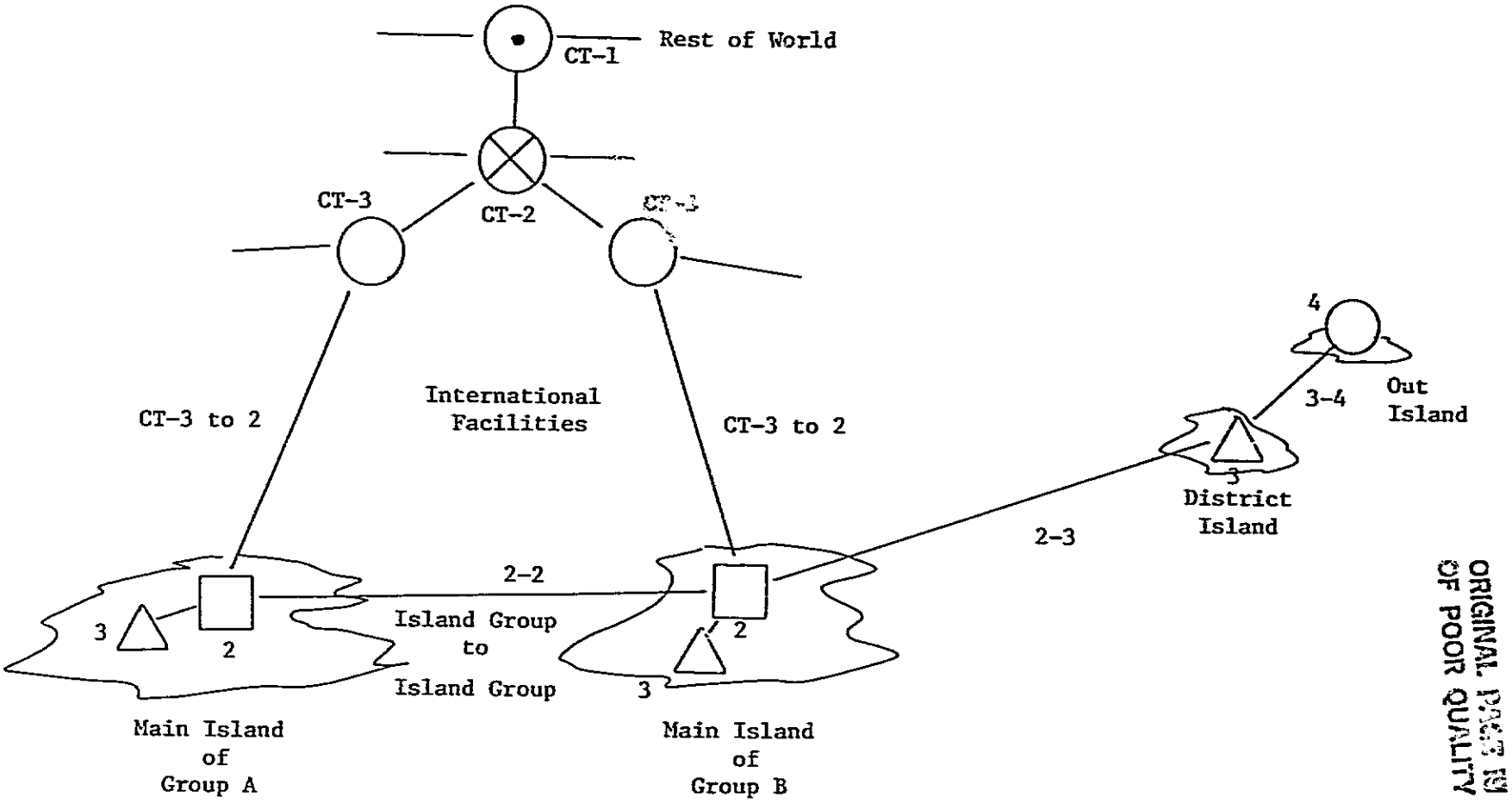


Figure D.11 - Inter-Island Group Communications

Note: Numbers designate CCITT office classes
(for illustration only)

Communications Choices

As indicated in Table 5.2.1 a wide variety of telecommunication technologies was examined. These were categorized by their attributes and limitations. A description of the individual technologies follows.

Figures E.1 illustrates the present day situation as far as the cost per circuit (the vertical axis) versus the number of circuits per link (the left axis) and the link distance (the right axis). If it could be built and if it could withstand the rigors of the ocean and the bottom, the submarine fiber optic cable might be a very useful communications technique. This cost assumption assumes that naked or nearly naked fibers could be strewn along behind the fishing boat as it travels from one island to the other. This is a totally untested technology and therefore has to be dismissed from near term consideration.

Again using present day costs, Figure E.2 shows the magnitude of the cost and the choices for internal national communications of an island group.

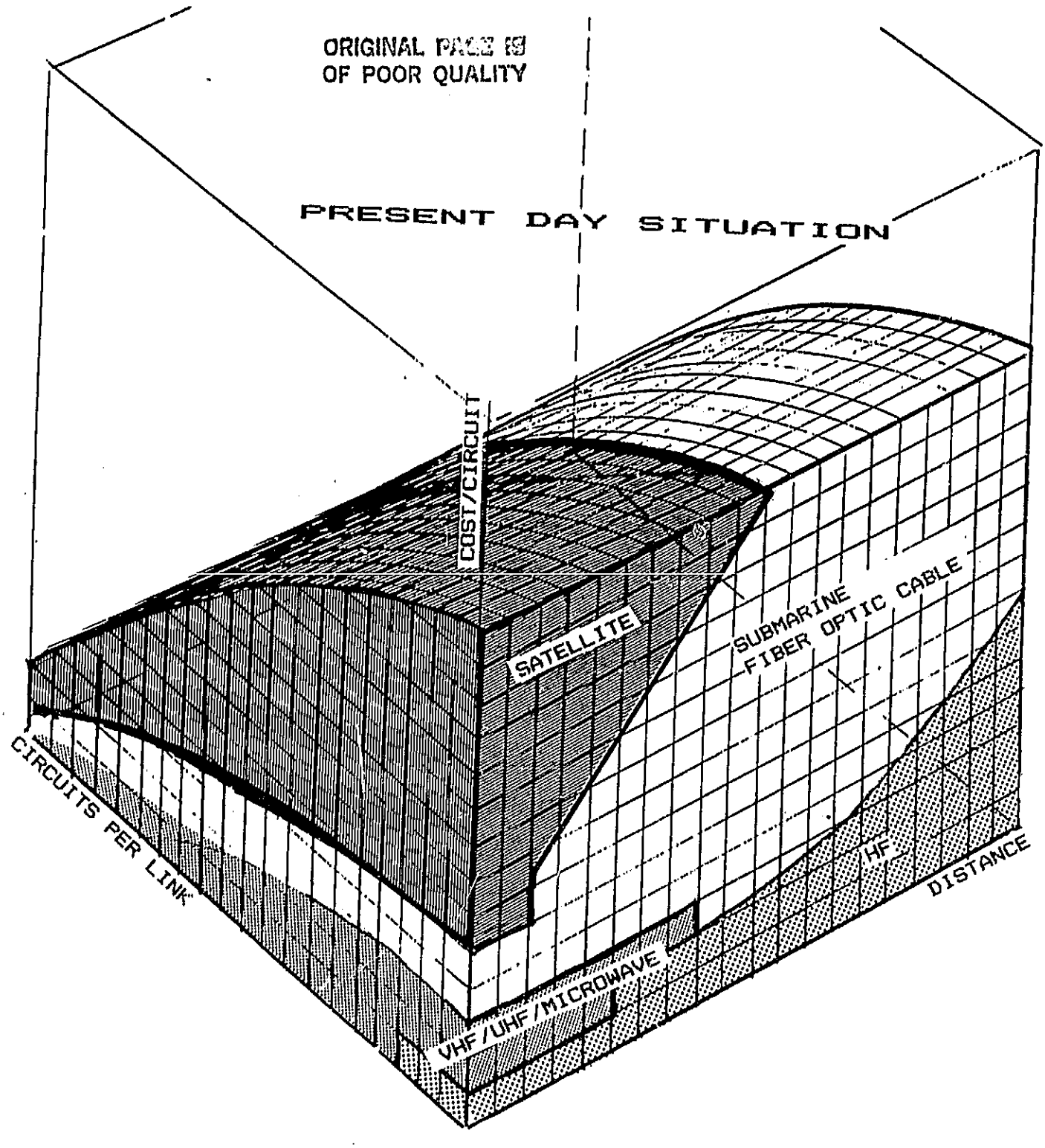
Satellite technology is rapidly changing and the cost per circuit of earth stations and satellites is declining at an astounding rate. Figure E.3 shows the impact of the changing earth station cost upon the three dimensional cost figure.

As the cost of telecommunication plummets, the number of potentially affordable choices increases substantially. These two

factors combine to drive the economy of scale to further reduce the cost per circuit.

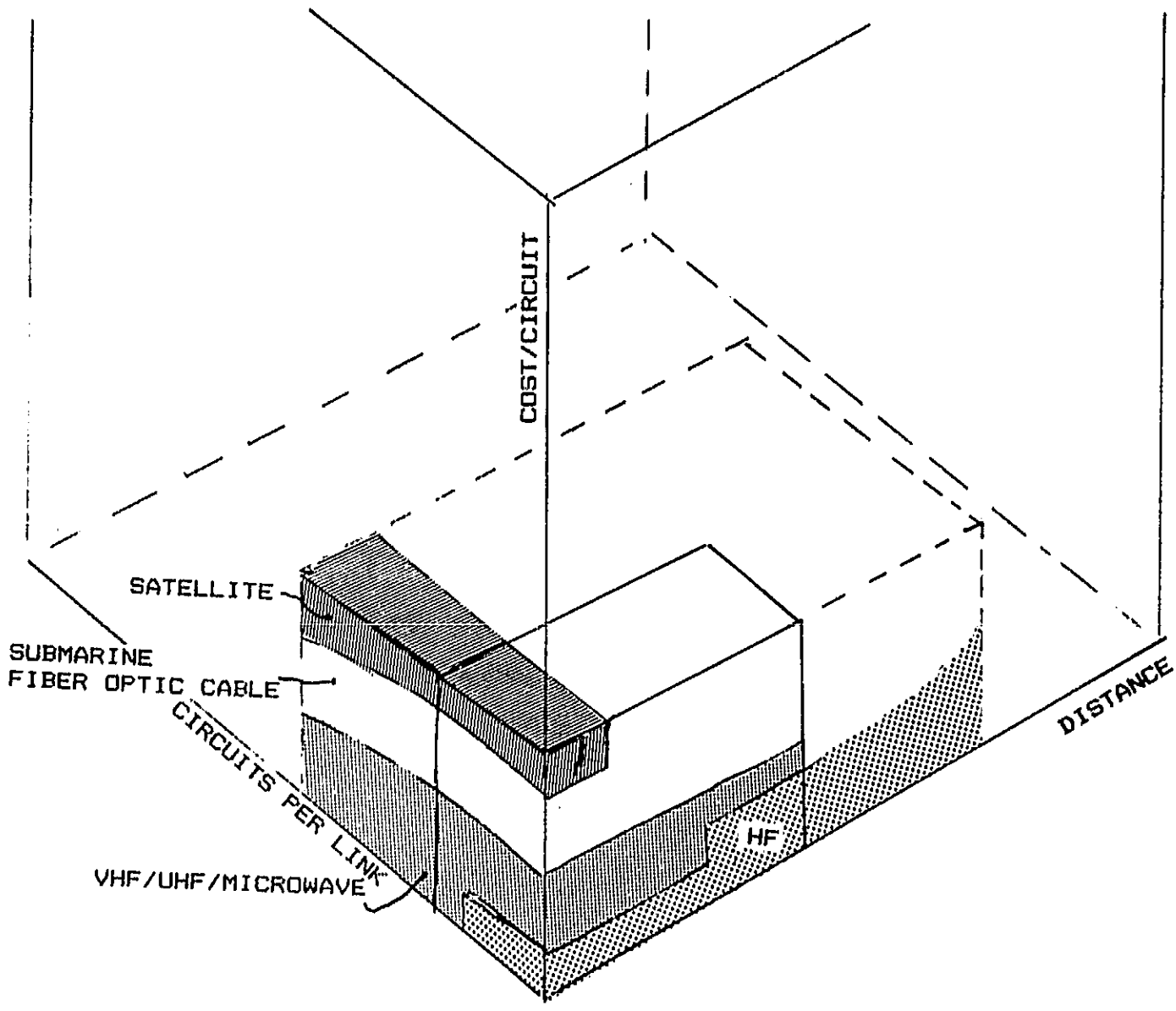
Table E.1 is a list of potential communications technologies that might become part of an integrated communications system such as described as elsewhere in this report.

Figure 5.1 - Present Day Cost Effectiveness



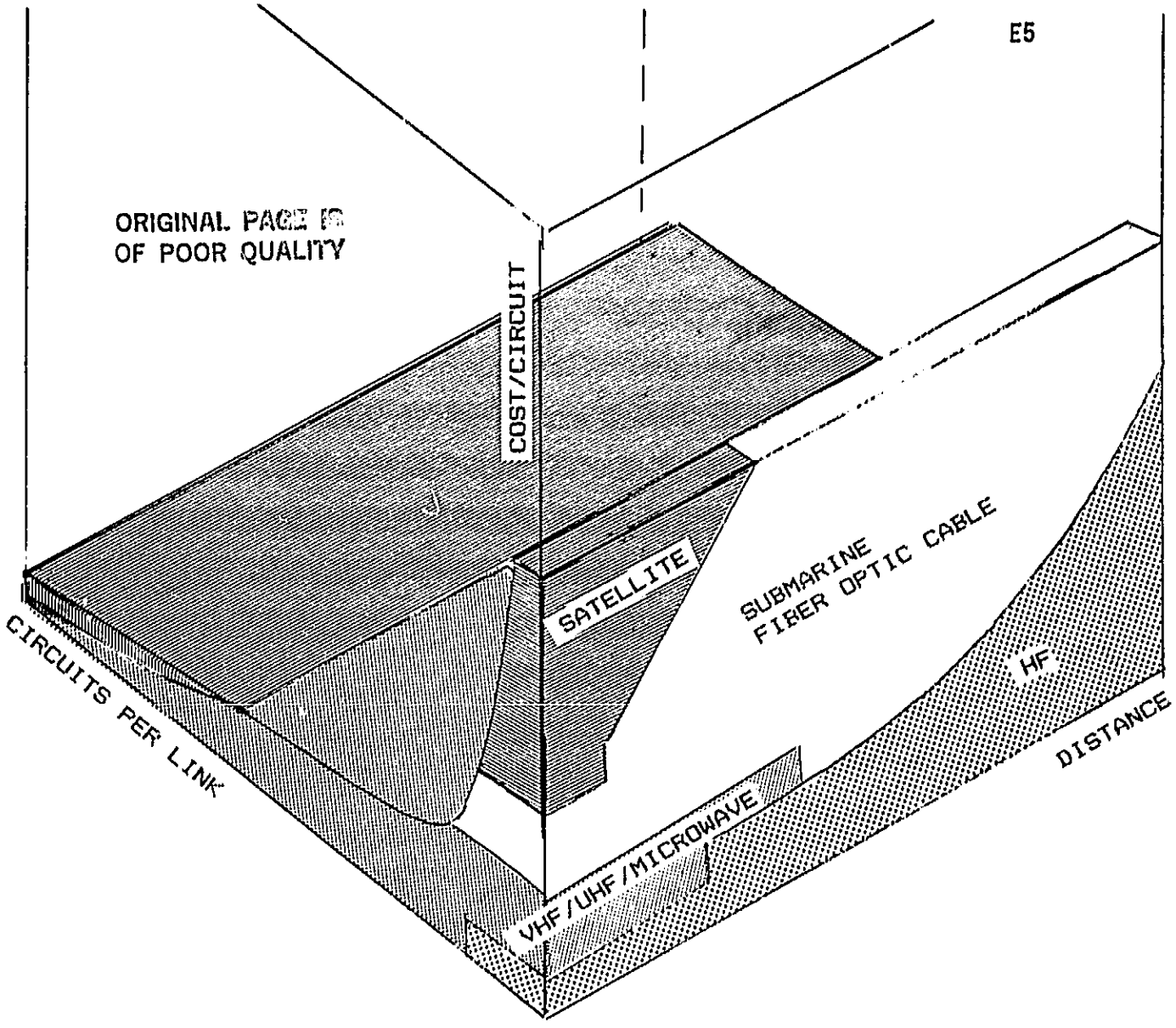
ALL ZONES ARE APPROXIMATE AND ARE FOR ILLUSTRATION PURPOSES ONLY

NOTE: HF AND SATELLITES ARE BOTH DESTINATION INSENSITIVE SERVICES AND THUS SOME INTERNAL COMBINATIONS MAY BE POSSIBLE TO LOWER THE COST/CIRCUIT



ALL ZONES ARE APPROXIMATE AND ARE FOR ILLUSTRATION PURPOSES ONLY

Figure E.2 - National Costs for various Forms of Telecommunications



NOTE: HF AND SATELLITES ARE BOTH
DESTINATION INSENSITIVE SERVICES AND THUS SOME INTERNAL COMBINATIONS
MAY BE POSSIBLE TO LOWER THE COST/CIRCUIT

Figure E.3 - Near Term Earth Station Cost Projections

Table E-1 Communications Technologies

INTER ISLAND FIBER OPTIC CABLES

The advent of high quality wide band fiber optics for communications introduces a new and novel possibility for inter-island communication.

Communications between a main island and its outlying islands may be accomplished through the use of multiple strand fiber optic cables. Multiple strands are used to guard against breakage or destruction of individual strands. One form envisioned is to reel the thin fiber optics strands over the stern of a local fishing boat as it journeys from one island to the other. The strands would be roughly equivalent in size to some of the fishing line presently used. The fishing boat would make multiple trips back and forth between the two islands. On each trip it may follow the same or a different path. The shallow water ends of the cable would be protected either by a shallow trench or through an armored cable. In the deep water portions, the cable would lie on the bottom.

It is recognized that various forms of erosion, currents, sea creatures, etc. may cause individual strands to break with time.

Since any one strand of fiber optic has far more bandwidth than is necessary for normal communications between the two islands, only one strand needs to survive. When the active strand separates, the traffic is transferred to another strand and so forth, until there are only a few strands left. At this time, the fishing boat repeats its journeys laying more fiber optic cable strands.

The intent here is to utilize simple local equipment and personnel to provide a wideband communications function.

The laying of this type of cable is totally different than the laying of a typical submarine cable where large ocean going ships are required. Here the sophistication of a modern cable laying ship is replaced by the simplicity of multiple strands and the abilities of local boatmen to lay such strands. In one sense, these local boatmen have been doing just this for many years as they lose countless miles of fishing line in the pursuit of their quarry.

An investigation needs to be made of the type of degradations that would be encountered on the open sea bottom and shorelines of such a system.

The simplist approach is to use unarmored strands of silicon. The erosive effects of the shifting sands, the nibbling of sea animals, the effects of coral and bottom vegetation all need to be considered.

Armored fiber optics cables are readily available today. These cables have, in general, been designed for telephone pole and buried installations.

Table E-1 Communications Technologies (Continued)

Since the very broadband characteristics of the cable are not utilized for the very thin route traffic between out islands and a central island, the repeaters may be stationed much further apart. Since the spectrum utilized is contained entirely within the fiber, there is no interference to other users of the frequency band. Therefore, entirely separate allocations may be made. This literally opens up a whole new spectrum of uses and applications. Wideband FM, for instance, may be utilized for transmission of voice or other services. This is another way of eliminating the need for submerged repeaters.

Given the inherently wideband capabilities of fiber optic cables, it is very difficult to envision, at this time, what new services the cable might be put to after the basic voice communications requirements are met. Certainly multi-channel voice is possible as is some television service. A paperless newspaper might also be envisioned. In this case the central island would transmit to the outlying islands brief bulletins which would be displayed LED or CRT units available to the general public on the island. This simple service would be similar to the moving letters display found in such places as Times Square, New York.

The system does not employ either the ionosphere, cause RF radiation, or require any external authority.

It is unlikely that this form of simple fiber optic cable could be used for very long distances (such as connecting island groups). As such this would be the local feeder cable to the central island from which another form of communications (HF, conventional cable or satellite) would make the connection to the rest of the world.

Undersea Cables

This description is limited to the traditional armored copper submarine cable. Examples of this class are the Transpac and Compac cables.

Most cables in this class are designed to carry trunk traffic between rim points. Very few landings are made. The principal landing points are the Hawaiian Islands, Fiji, Guam, and New Zealand.

It is interesting to note that each of these landing points has become a hub of its own within the Pacific. Is this cause or effect? Furthermore, each of these locations now has an INTELSAT earth station in operation. The submarine cables are owned by the operating administrations or telecommunications corporations of the rim nations. There seems little interest in providing telecommunications to small islands or groups of islands along the basic route of the cable. The next large cable installation will run directly from Honolulu to Japan without any landings.

Table E-1 Communications Technologies (Continued)

A cable inherently is a point-to-point device. There is no broadcast capability available. Unlike the Carribean and Europe, there are few, if any, secondary cables radiating out from the landing point to adjacent island groups. In one sense, the INTELSAT earth stations, HF radio and tropo scatter all serve this function.

Submarine cables of this class are expensive to lay and require maintenance. For these reasons they are not economical for short distance, low traffic connections in an area like the Pacific.

Because of operational, administrative and economic constraints, it is unlikely that the copper undersea cable will become a major means of linking island groups.

Meteor Burst Communications

Meteor scatter systems operate on the basis of reflections from passing meteors. These meteors leave ionized trails which may be used as reflection points to connect one location with another. The number of meteors varies with the time of day and with the season. Point-to-point links may be constructed at VHF frequencies (typically 40-MHz). Since the reflections can only connect two relatively small areas on earth, many simultaneous transmissions may occur on the same frequency band without mutual interference. The meteors do not occur continuously and therefore, there is a need for constantly attempting to make connection from one island to the other. As soon as a connection is made, a signal is returned and the stored up data is sent in a burst (hence the name meteor burst) to the destination station. Because the error rate varies with the degree of ionization a feedback method is required to assure that the signals were received properly. If not, a further transmission is necessary. Voice is not normally used in this manner as it is not applicable to this type of store and forward system. The transceivers operate at several hundred watts and use five element yagis. Teletype is the best form of transmission.

This method may be suitable for connecting islands within a thousand miles of one another. It employs relatively simple equipment and requires little of the operator. With the wide spread advances in buffer storage equipment utilizing LSI integrated circuit chips, this technique becomes more feasible every day.

Table E-1 Communications Technologies (Continued)

Several burst scatter systems are in use including one by the Western Union Company for collecting hydrographic data. Another is used by NORAD for emergency communications. Manufacturers of this equipment claim relatively good throughput in spite of the bursty form of communications. This type of communications might be particularly interesting for very low bit rate applications, such as summoning help, reporting basic statistics, ordering supplies, etc.

Because there are relatively few suppliers, further study is necessary to verify the claims of connectivity and performance. The lack of a voice capability may be a serious drawback. Other forms of traffic, including reservation and commercial teletype could be accommodated and connected into the rest of the world links through higher order communications facilities. Meteor scatter,therefore, could provide the links from an island group hub to some of the outlying islands. As such, it may be an entry mechanism into the world of communications for some of these outlying islands.

High Frequency Radio

High frequency (HF) radio has been used for decades for both local and long distance telecommunications. Using the ITU definition, HF radio consists of that part of the spectrum between 3 and 30 Megahertz. This region (also known as short wave) depends on the ionosphere to reflect the signals radiated by relatively simple antennas. The strength of the received HF signal depends on many factors including the time of day, the height of the ionosphere and the distance from the transmitter. Directional antennas may be employed to increase the signal strength and its direction. Because the short wave frequencies are so widely used and because the ionosphere is often unpredictable, substantial fading and co-channel interference takes place. HF radio links have been used for many years for communications. Most advanced nations do not depend on the HF radios for domestic services. They have replaced these links with microwave, cable and satellite distribution methods. There are many regions of the world where these technologies may not be applicable for one reason or another and therefore, HF radio is still widely used.

HF radio is used for long distance voice, facsimile (especially weather) and radio teletype services. It is widely used by ships.

It tends to represent the lowest technology risk because it has been available for so long. It is highly acceptable in the Pacific at this time and requires a rather minimal amount of service and operator training. The operator must have the ability, however, to cope with the fading and the interference. In some cases, this may require frequency hopping to maintain a contact.

Table E-1 Communications Technologies (Continued)

This technology is applicable to relatively small numbers of channels and quickly gets out of hand if more than ten or twenty voice channels are required in most cases. Because of the fading and other characteristics it is difficult but not impossible to connect high frequency radio telephone into the international telephone community. When this is done, it is often done through an operator at a hub (such as in Honolulu). The operator provides the basic signaling and toll keeping functions.

HF radio services are characterized by relatively narrow bandwidths therefore they have limited applicability for small computers or video.

Very High Frequency Radio

VHF links are often used for short-haul telecommunications.

The ITU definition of VHF is the range between 30 and 300 Megahertz (1 and 10 meters). In the United States, these frequencies are used extensively for mobile radio telephone, beepers television channels 2 to 13 and FM radio broadcasting. Some point to point VHF services are also used. In the Pacific, the line of sight range and the relative simplicity of the equipment has permitted local distribution networks to be established. VHF radio equipment is easy to operate and is usually quite rugged. Much of this eqipment was originally designed for taxi cabs, trucks and other heavy service vehicles and therefore, can accomodate many of the rigors of the Pacific.

Unlike the fading and interference of the HF radio circuits, VHF radio tends to use frequency modulation, be essentially interference free and it either is very quiet or does not work at all.

A number of systems, using signalling and other telephone operating procedures, have been established throughout the Pacific. The approximate range of a VHF radio is about 30 or 40 statute miles. This may be extended if the transmitter and receiver are both elevated or if intermediate VHF or UHF relay stations are employed.

Except under relatively rare circumstances, the VHF signals are insensitive to the ionosphere, the weather and other natural phenomena. Since the signals are limited to the line or sight distance, there usually is little frequency congestion.

Table E-1 Communications Technologies (Continued)

Ultra High Frequency Radio

UHF radio is the spectrum between 300 MHz and 3 GHz (10 centimeters to 1 meter). In the United States, it is common to think of this band as being occupied by UHF-TV stations (channels 14-83) but it contains many other services including much point-to-point microwave. For the purpose of this summary, the service is defined to be the personal radio telephone service and therefore excludes the normal point to point microwave functions (see another summary).

At UHF frequencies the effects of foliage and even rainfall in some instances become more noticeable. The radio equipment gets a little more fragile and may require more frequent service and a higher level of training than either HF or VHF radio. Within the United States there is quite a lot of new and used equipment available for use in the 400 and 800 MHz regions for point-to-mobile and even point-to-point applications.

The UHF equipment tends to use frequency modulation and it is capable of a wider bandwidth service. The technology at these frequencies continues to be more favorable to their use.

Tropo Scatter Links

Frequencies throughout the lower microwave bands (from approximately 400 MHz to 6 GHz) may be used for over-the-horizon communications. The tropospheric (tropo) scatter makes use of the reflection characteristics of the troposphere that surrounds the earth. High powered (1 to 10 kW) transmitters and highly directional antennas at both ends of the link illuminate a common volume in the troposphere. Locations separated by as much as 400 statute miles may be connected in this manner. The tropo stations tend to be limited in capacity and quite expensive to construct.

Constant Altitude Balloon Repeaters

As part of the meteorological and meteorological satellite programs, the constant altitude balloon has been developed. These balloons seek a particular height above the earth. If the balloon rises above this height, its lifting capacity decreases, and it falls back towards the nominal height. Conversely, if it decends too far, it lifts itself back into position through a passive system. A series of such balloons was used in the French Eole experiment several years ago. These were free floating

Table E-1 Communications Technologies (Continued)

balloons. More recently a station keeping balloon system has been proposed for communications. The balloon has a gondola package with a communications repeater. The repeater derives its energy from solar cells and batteries. The balloon repeater acts as a low altitude satellite. Some balloons have been designed to operate at 70,000 feet. If the balloon can be kept in position over an island, it may provide local traffic within that island and to all other islands in sight. As anyone who has flown in today's jet aircraft at 40,000 feet knows, the area of coverage is immense.

The up and down links probably would be at microwave frequencies and have all the attributes and drawbacks of point-to-point microwave. In addition, there is the problem of repairs to the remote (balloon) repeaters. Unless there are multiple balloons (to have at least one spare available at all times) it would be difficult to repair a repeater without taking the entire system out of service.

While this technology is interesting, it has many potential operational and servicing problems associated with it. It would not seem that this is a near term solution. If the technology is developed for other mainland applications, it might be applied to the Pacific island case. The advent of relatively simple microwave transmitting and receiving equipment (derived from the ever simpler satellite earth stations) could make this an attractive long range solution to both local and inter-island communications. In an extreme case, there might even be balloon-to-balloon links to tie together various clusters of islands. Much of the technology involved here is similar to the satellite requirements. Unlike geostationary satellites the balloon concept does not require any orbit space.

INTELSAT Satellites

The International Telecommunications Satellite Organization has two satellites (INTELSAT IV-F8 and INTELSAT IV-F4) in the Pacific Ocean region at this time. Both satellites are operational with F8 being the primary satellite and F4 being a contingency satellite. INTELSAT IV-F5 which had been in the Pacific has been removed from service.

When used in a heavy trunk mode, these satellites have an average capacity of 3,750 circuits plus two TV channels. Each satellite has twelve transponders of 36-MHz each. In addition to the global coverage, there are two steerable spot beam transmit antennas. The anticipated design life was seven years. INTELSAT IV-F4 was launched on Feb. 14, 1972 and F8 on Dec. 15, 1974.

Table E-1 Communications Technologies (Continued)

The up-link is provided through global coverage horns. The figure of merit of the up link varies from -15 dBi/K at the beam center (at 174 to 180 degrees East longitude at the Equator) to -18.6 dBi/K at the edge of the earth. The equivalent isotropically radiated power (eirp) at the beam center is 25.5 dBW for the global beams and 37.0 dBW for the spot beams. The spot beams cover an angle of 4.5 degrees each. It is important to realize that the spot beams only work in the space-to-earth direction. Any earth stations utilizing the INTELSAT IV series must have sufficient power for the global up-link antenna.

Each spot beam may be connected to up to four transponders of 36 MHz each. Most operations have not used the spot beams on INTELSAT IV. If they are used in the Pacific, they are probably pointing at Japan and the northwest U.S./British Columbia. These transponders and beams would be used for heavy trunk traffic between these points. The beams on the spare satellite might be available for Pacific island coverage.

A system based on INTELSAT IV spot beam coverage may be time limited and potentially dangerous from an operational standpoint. The INTELSAT IVs have limited lifetimes remaining.

The more recent series (INTELSAT IV-A and V) do not have the spot beams. The use of an INTELSAT IV-A or V for coverage of the Pacific Ocean basin must be done from an extreme easterly or westerly orbit location so that the hemispheric and zone beams may be used.

These satellites have coverage gaps in the middle of their service area. This is because there is little or no traffic in mid-Atlantic, mid-Indian Ocean or mid-Pacific. Global coverage is provided in these areas but at a lower power level. To make use of the higher power and higher sensitivity portions of the IV-A and V satellite series, it is necessary to move the satellite position substantially. While this may seem a radical procedure, the path loss changes only 1.8 dB. This is more than made up by the higher antenna gains on both the up and down links for these satellites

The present COMSAT earth stations in the Pacific utilize the global beams of these satellites. These earth stations tend to use 13 meter (42.6 foot) antennas and fully redundant equipment. The cost of the Palau Island's earth station is $1,710,000 as indicated in the January 28, 1981 filing with the Federal Communications Commission. This is an INTELSAT standard-B class earth station.

Table E-1 Communications Technologies (Continued)

Voice, video and record traffic may all be readily handled through the INTELSAT series.

Another alternative is the leasing of specific transponders on the INTELSAT series and operating on the basis of a domestic satellite service. The charge for such a service is approximately $800,000 per year. At this price, a preemptable service is offered. The traffic in the Pacific is the lowest of the three ocean areas and therefore, the likelihood of being preempted is relatively small.

The use of the spot beams on INTELSAT V is not feasible since these are limited to relatively high north latitudes. Even inverting an INTELSAT V would not provide the coverage because now it would cover south latitudes in the range of 40 to 50 degrees.

Existing Resources in the Pacific Basin

An inventory of the existing satellite and cable facilities was made as part of the engineering study. Table F.1 lists the submarine cables in the Pacific. The capacity and ownership are given. Figure F.1 shows the routes taken by these cables. It is significant to note that a new cable (labelled B) runs from Hawaii directly to Japan and stops at no islands enroute. The A cable is a new U.S. mainland to Hawaii link, and C runs from Canada to New Zealand and Australia, stopping only at Hawaii, Fiji and Norfolk Island. Table F.2 lists the cables projected for Pacific service during the next decade.

The satellites serving the Pacific Basin (present and projected for the immediate future) are shown in Figure F.2. Military satellites (such as DSCS and Fleetsatcom) have not been shown because they cannot provide domestic and international telecommunications of the type studied herein. As indicated in section 5 of the present study, not all of the satellites positioned over the Pacific provide coverage to all of the island nations.

Table F.3 and Figure F.3 shows the location of the INTELSAT earth stations.

A thorough listing of all the Pacific cable and satellite facilities is given in Table F.4.

Based upon the existing resources and the pent up demand for telecommunications service. an estimate has been made of the number of circuits needed for just those countries visited during the present study. (The figures in Tables F.5 through F.8 were provided by the ITU regional office in Suva, Fiji).

The estimates are based on information acquired by the PSSC team during country visits, with assistance from the ITU. The first column of each table lists the island nations. The second provides estimates of the earth stations (or voice circuits) in the fixed satellite service. The columns for mobile and international satellite services are estimates based on each of these services being located on the same satellite as the fixed service. No estimates of the number of international earth stations is provided as the fixed and mobile earth stations might serve this function. Not all fixed or mobile stations would be authorized to originate international traffic (for toll reasons).

Assuming that these estimates represent the ideal and that it may not be realized, it is possible to extrapolate for the region (beyond the selected nations and entities listed) and suggest that some 3000 earth stations will be needed by the island nations in the Pacific by 1992.

Television may become firmly established in American Samoa, the Cook Islands, Fiji, Nauru, Niue, Papua New Guinea, the Solomon Islands, Tonga, Vanuatu and Western Samoa within the next several years. In some of these entities (especially where the islands are spread out) some form of direct broadcasting could be chosen to feed community receivers. At least 75 such receivers are currently projected, but the final number may be much higher. The availability of low cost TV receive only earth stations (for the home markets in Europe, North America and Japan) may make this service attractive. The major limitations to direct broadcasting at 12 GHz in the Pacific are the heavy rainfall (and the resulting attenuation -- see Figure 5.2.4) and the WARC'79 satellite orbit assignments (see Table F.9). The satellite assignments are spread over the arc 110E to 160W (200E) (or 90 degrees) and would require at least ten satellites.

Number	Official Name	Owner(s)*	Capacity
33	Hawaii Number 1(HAW 1)	AT&T + Hawaiian Tel.(GTE)	51 voice circuits
59	Commonwealth Pacific(COMPAC)	Canada,C&W,NZ,Australia	82
68	Transpacific No. 1(TPC 1)	AT&T + Hawaiian Tel	142
		AT&T + KDD (Japan)	138
69	Hawaii No. 2(HAW 2)	AT&T + Hawaiian Tel.	142
70	Guam-Philippines	AT&T + Philippines L.D. Telco	128
80	Hawaii-Johnson Island	U.S. Government	60
85	S.E. Asia Comm. Cable(SEACOM)	Australia,Malaysia,Singapore,	
		C&W,Canada,New Zealand	166
145	Hawaii No. 3 (HAW 3)	AT&T + Hawaiian Tel.	845
153	Transpac 2 (TPC 2)	ATT,HTC,ITT,RCA,WUI,KDD & OTC(A)	845
171	Okinawa-Miyazaki	NTT(Japan)	2700
173	Australia-Papua New Guinea	Australia+New Guinea	480
179	Okinawa-Luzon-Hong Kong (OLUHO)	KDD,Philippines,C&W	1380

Table F.1 - Submarine Cables in the Pacific

* AT&T=American Telephone & Telegraph Co.;C&W=Cable & Wireless, Ltd.; Canada=TeleGlobe Canada; HTC=Hawaiian Telephone Co. (GTE); ITT=ITT Worldcom; KDD=Kokusai Denskin Denwa Co.,Ltd.(Japan); NTT=Nippon Telegraph & Telephone Public Corp. (Japan); OTC(A)= Overseas Telecomm. Comm. (Australia);WUI=Western Union Int'l.

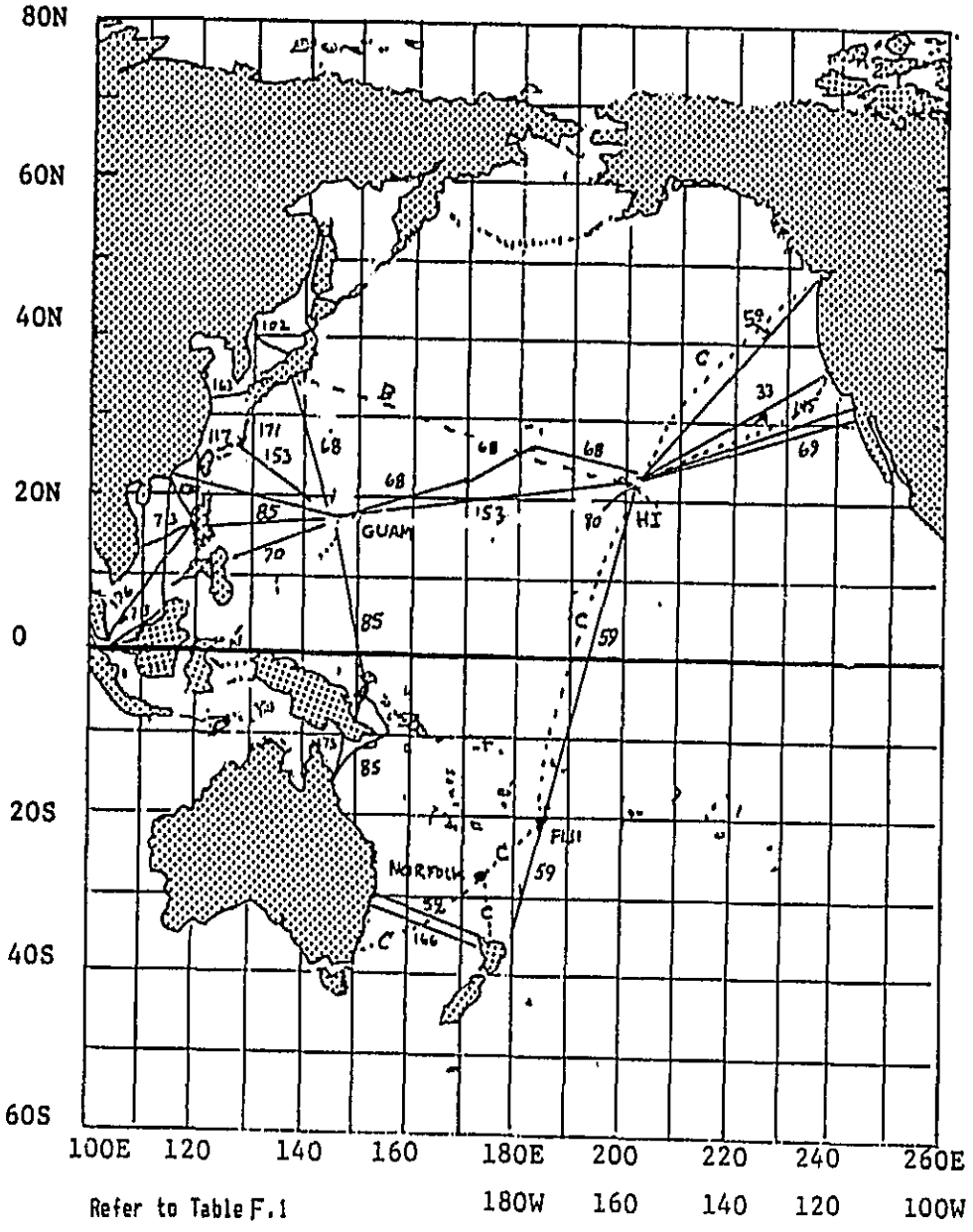
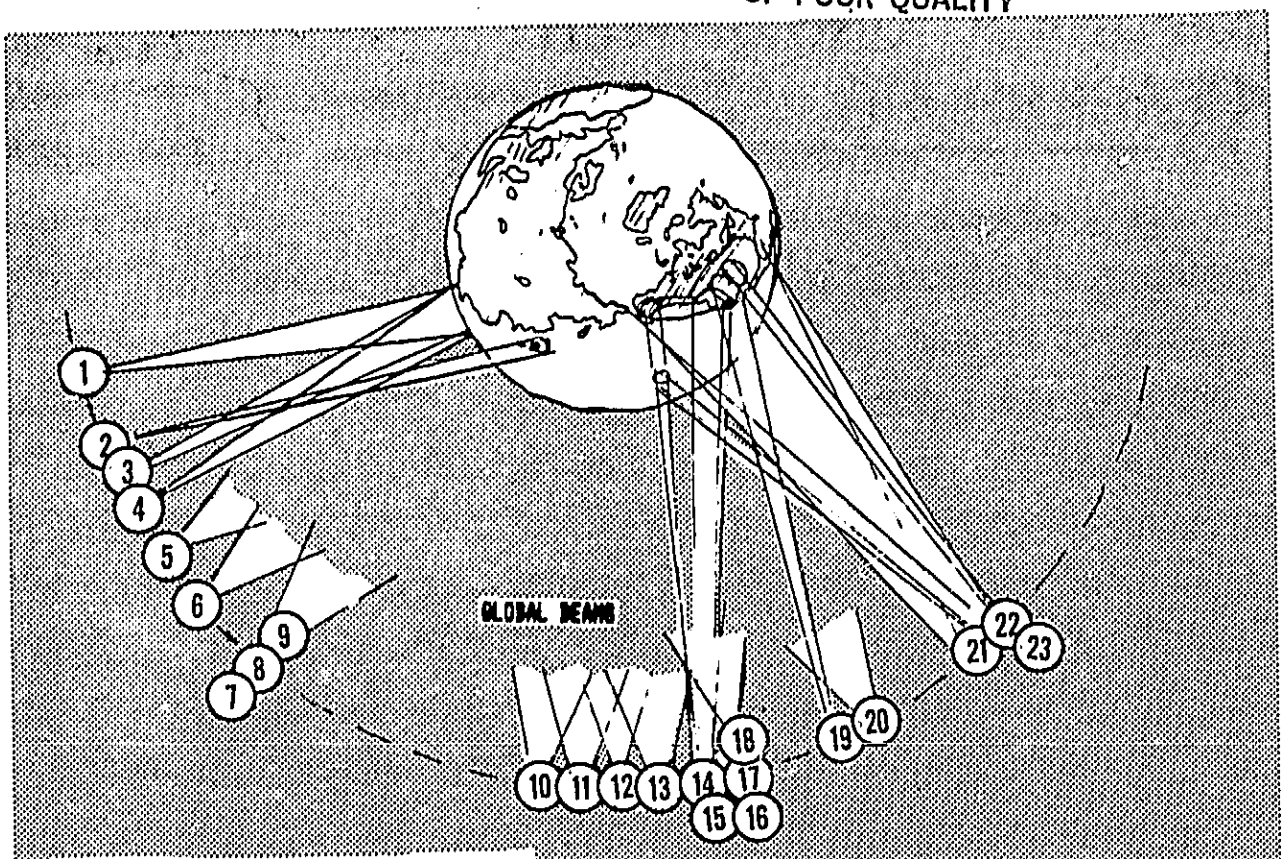


Figure F.1 – Pacific Submarine Cables

Table F.2 - Submarine Cables Projected for the Pacific

Cable	Circuit Capacity	Possible Service Date	Cable Length (Nautical Miles)
Taiwan-Guam	845	1981	1,700
ASEAN T-S-M	640	1982	850
ASEAN T-P	640	1982/83	1,570
TPC-3 (Japan-Hawaii)	1600	1985/86	3,700
HAW-4 (Hawaii-U.S. Mainland)	4000	1982	2,400
ANZCAN			
Sydney-Norfolk	1200-1380	1983	950
Norfolk-Fiji	1200-1380	1983	950
Fiji-Hawaii	1200-1380	1983	2,870
Hawaii-Vancouver	900-1380	1983	2,560
Norfolk-Oakland	480	1984	630



SATELLITES SERVING THE PACIFIC BASIN

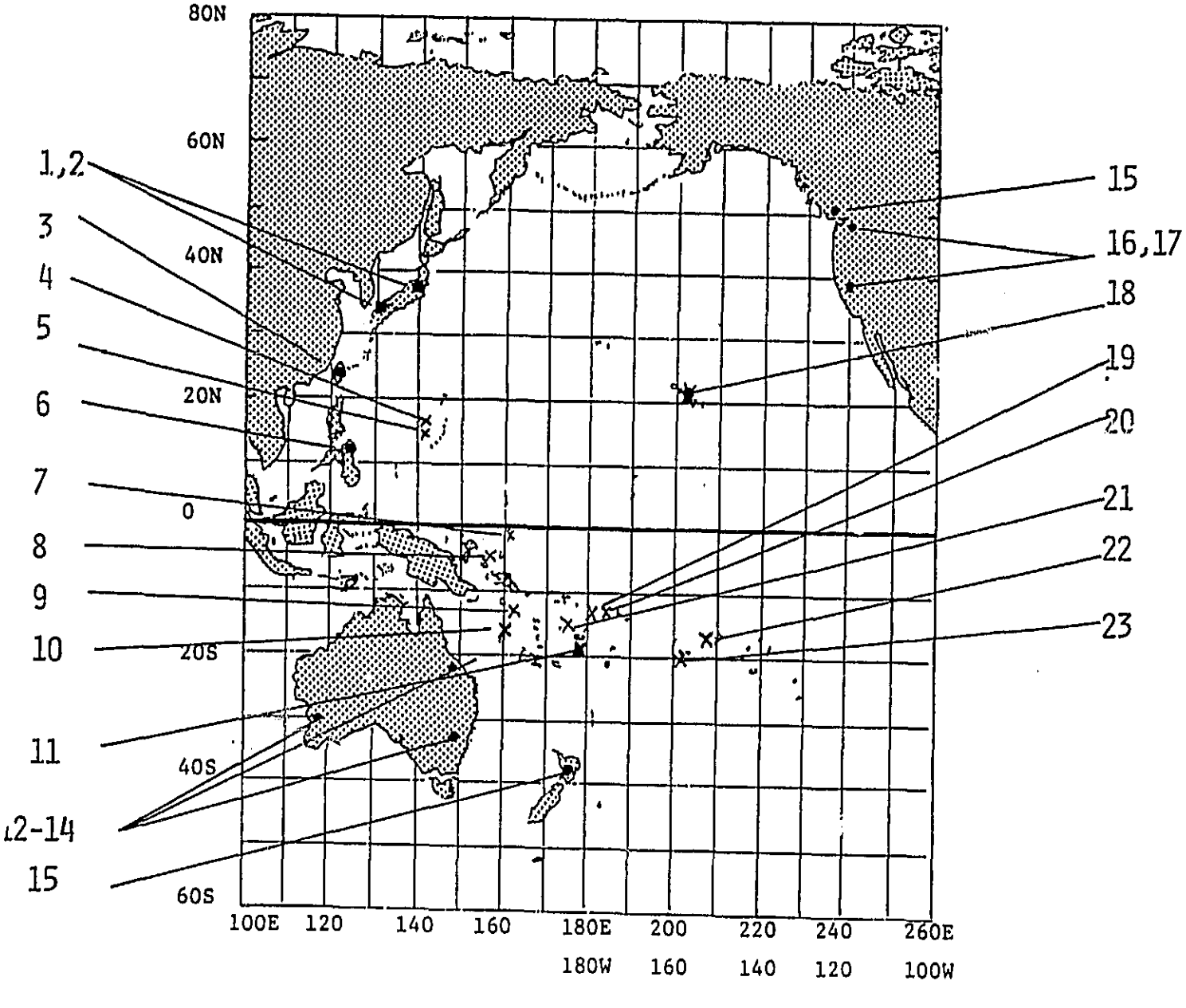
KEY	NAME	NATION	FREQ	DATE
1	Palapa-B	Indonesia	6/4	83
2	Yuri (BS-2a)	Japan	14/12	83
3	Palapa-B	Indonesia	6/4	83
4	"	"	"	84
5	STW-1	P.R.China	"	8?
6	Statsionar-15	U.S.S.R.	"	8?
7	Volna-6	"	1.6/1.5	8?
8	Statsionar-7	"	6/4	8?
9	Loutch-4	"	14/12	8?
10	INTELSAT	INTELSAT	6/4	74
11	Marisat	INMARSAT	1.6/1.5	76
12	Marecs	"	"	83
13	INTELSAT	INTELSAT	6/4	72
14	STC-PSA	U.S.A.	18/12	86
15	TDRSS-WEST	"	2/2 15/13	83
16	Statsionar-10	U.S.S.R.	6/4	8?
17	Volna-7	"	1.6/1.5	8?
18	Loutch-P4	"	14/12	8?
19	STC-MSA	U.S.A.	18/12	86
20	ATS-1	"	VHF/VHF	66
21	Satcom-IR	"	6/4	82
22	Satcom-I	"	"	75
23	STC-CSA	"	18/12	84

8?=UNKNOWN DATE PROBABLY IN THE 80'S.

Figure F..2 - Pacific Satellites

KEY	LOCATION	OPERATOR	DATE INSTALLED
1	Ibaraki, JAPAN	KDD	1971
2	Yamaguchi, JAPAN	KDD	1969
3	Taipei, REPUBLIC OF CHINA	MIN. OF COMMUNICATIONS	1969
4	Saipan, N. MARIANA	COMSAT	1980
5	Pulantat, GUAM	RCA GLOBCOM	1969
6	Tanay, PHILIPPINES	PHILCOMSAT	1980
7	Nauru, NAURU	GOV'T of NAURU	
8	Honiara, SOLOMON ISLANDS	SOLTEL	
9	Vila, VANUATU	VANITEL	
10	L'ile Nou, NEW CALEDONIA	MIN. OF POSTS & TELECOMM.	
11	Nuku'alofa, TONGA	CABLE & WIRELESS	
12	Carnarvon, AUSTRALIA	OTC (A)	1969
13	Ceduna, AUSTRALIA	OTC (A)	1969
14	Moree, AUSTRALIA	OTC (A)	1968
15	Lake Cowichan, CANADA	TELEGLOBE CANADA	1972
16	Brewster, WA. U.S.A.	COMSAT	1966
17	Jamesburg, CA. U.S.A.	COMSAT	1968
18	Paumalu, HI. U.S.A.	COMSAT	1966
19	Afiamalu, W. SOMOA	GENERAL POST OFFICE	1980
20	Pago Pago, AM. SAMOA	COMSAT	
21	Suva, FIJI	FINTEL	1975
22	Papenoo, FR. POLYNESIA	OFFICE OF POST & TELECOMM.	
23	Avarua, COOK ISLANDS	CABLE & WIRELESS	1980

Table F.3 - INTELSAT Earth Stations



Refer to Table F.3 on Page 7

Figure F.3 – INTELSAT Earth Stations

Table F.4 - Pacific Communications Services

STATION NAME	SAT. SYST	SUB CABLE	NATION
Carnarvon	I	A-PNG	AUSTRALIA
Cairns, Queensland		SEACOM	
"			
Canberra	A		
Moree	I		
Sydney	A		COMPAC
"		ANZCAN	
"		TASMAN	
U. of N S Wales	A		
(Domestic)	ANSCS*		
Norfolk Island		ANZCAN*	
Lake Cowichan	I		CANADA
Port Alberni		COMPAC	
Vancouver	A		
Avarua	I		COOK IS.
Rarotonga	A		
Suva	A,I	COMPAC	FIJI
		ANZCAN*	
Papenoo	I		FRENCH POLYNESIA
Djatiluhur	I		INDONESIA
(Domestic)	Palapa		
Ibaraki	I		JAPAN
Ninomiya		TPC-1	
"(?)		TPC-3*	
(Domestic)	Yuri		
"	Sakura		
Tarawa	A		KIRIBATI
Alafua	A		

Saipan	A,I		N. MARIANAS
Majuro	A		MARSHALL ISLANDS
Kosrae	A		FEDERATED STATES OF MICRONESIA
Ponape	A		
Truk	A		
Yap	A		
Nauru	I		NAURU
L'ile Nou	I		NEW CALEDONIA
Noumea	A		
Warkworth	I		NEW ZEALAND
Wellington	A	TASNAM	
Auckland		COMPAC	
"		ANZCAN*	
"			
Niue	A		NIUE
Palau	A,I*		PALAU (BALAU)
Lae	A		PAPUA NEW GUINEA
Port Moresby	A	A-PNG	
Madang		SEACOM	
(Domestic)	ANSCS*		
Pinuguay	I		PHILIPPINES
Baler		TPC-1	
San Miguel		PI-VIET-NAM	
Cirrimao		OLUHO	
"		PHILSIN	
(Domestic)	Palapa		

Honiara	A,I		SOLOMON IS.
Nuku'alofa	A,I		TONGA
Funafuti	A		TUVALU
Jamesburg	I		U.S.A. CA.
Point Arena	Domsats		
San Luis Obispo		HAW-1	
"		HAW-2	
Santa Cruz	A	HAW-3	
Various Univ.	A		(CA.)
Morrison (Denver) (PSSC)	A		(CO.)
Barbers Point	Westar		(HI.)
Barking Sands (DOD)	Satcom		
Hanauma Bay		HAW-1	
Honolulu	A		
"	Satcom		
Hickam	Westar		
Hickam*	I*		
Kaena Point	Westar		
Kaipapa	Domsat		
Keawaula Bay		COMPAC	
Makaha		HAW-2	
"		HAW-3	
"		TPC-1	
"		TPC-2	
"(?)		TPC-3*	
"(?)		ANZCAN*	
Makua		HAW-JI	
Sunset	Comstar		
Paumalu	I		
Waimanalo	Comstar		
Brewster	I	HAW	(WA.)
Pago Pago	A,I		(AM. SAMOA)
Pulantant	A,I		(GUAM)
Agana		TPC-I	(GUAM)
"		TPC-2	
Tumon Bay		SEACOM	
Finegayan* (DOD)	I*		
Johnston Islands		HAW-JI	(JOHNSTON IS.)

Midway Is.	TPC-1	(MIDWAY)
Wake Is.	TPC-1	(WAKE)
Efate Vila	I A	VANUATU
Afiamalu Apia	I A	W. SAMOA

****

NOTES

A=ATS-1 (PEACESAT, Univ. of South Pacific and DISPNET)
ANSCS* = Australian Domsat**
COMSAT=HAWTEL DOMESTIC US satellite**
I-INTELSAT
Palapa=Indonesian/SEATO domsat*
Sakura=Japanese domestic satellite (also know as CS, CSE or JCS)**
Satcom=RCA SATCOM domestic US satellite**
Westar=Western Union domestic US satellite**
Yuri=Japanese direct broacast satellite (also known as BS, BSE or JBS)**

*=PROPOSED
**=The coverage of these satellites is generally limited to the areas indicated for technical or institutional reasons.

Date: May, 1981

Prepared at

THE COMMUNICATIONS CENTER
OF CLARKSBURG

Clarksburg, Maryland, USA

TABLE F.5

VOICE CIRCUIT PROJECTIONS FOR 1987

VOICE CIRCUITS (FULL CHANNELS)

NATION	FIXED	MOBILE	INT'L	TOTAL
AMERICAN SAMOA	100	100	50	250
BELAU	120	60	12	192
COOK ISLANDS	25	10	20	55
F.S. OF MICRONESIA	110	20	100	230
FIJI	200	100	300	600
KIRIBATI	60	20	0	80
NAURU	0	0	12	12
NIUE	0	0	0	0
PAPUA NEW GUINEA	2000	200	48	2248
SOLOMON ISLANDS	200	60	30	290
TONGA	30	12	40	82
TUVALU	18	1	4	23
VANUATU	90	50	28	168
WESTERN SAMOA	50	10	38	98
G R A N D T O T A L S				
	3003	643	682	4328

TABLE F.6

VOICE CIRCUIT PROJECTIONS FOR 1992

VOICE CIRCUITS (FULL CHANNELS)

NATION	FIXED	MOBILE	INT'L	TOTAL
AMERICAN SAMOA	200	200	100	500
BELAU	240	15	120	375
COOK ISLANDS	50	15	40	105
F. S. OF MICRONESIA	240	30	60	330
FIJI	400	200	160	760
KIRIBATI	100	40	0	140
NAURU	0	0	20	20
NIUE	0	0	0	0
PAPUA NEW GUINEA	5000	400	96	5496
SOLOMON ISLANDS	400	90	60	550
TONGA	70	24	90	184
TUVALU	27	1	7	35
VANUATU	200	80	60	340
WESTERN SAMOA	100	20	80	200
GRAND TOTALS	7027	1115	893	9035

TABLE F.7

EARTH STATION PROJECTIONS FOR 1987

NATION	EARTH STATIONS FIXED	MOBILE	INT'L	TOTAL
AMERICAN SAMOA	30	100		100
BELAU	60	30		90
COOK ISLANDS	15	10		25
F. S. OF MICRONESIA	40	20		60
FIJI	100	100		200
KIRIBATI	24	20		44
NAURU	0	0		0
NIUE	1	1		2
PAPUA NEW GUINEA	1000	200		1200
SOLOMON ISLANDS	40	60		100
TONGA	12	12		24
TUVALU	9	4		13
VANUATU	30	50		80
WESTERN SAMOA	15	10		25
GRAND TOTALS	1376	617		1993

TABLE F.8

EARTH STATION PROJECTIONS FOR 1992

NATION	EARTH STATIONS FIXED	MOBILE	INT'L	TOTAL
AMERICAN SAMOA	60	200		260
BELAU	120	60		180
COOK ISLANDS	15	15		30
F. S. OF MICRONESIA	80	30		110
FIJI	200	200		400
KIRIBATI	48	40		88
NARAU	0	0		0
NIUE	2	1		3
PAPUA NEW GUINEA	2000	400		2400
SOLOMON ISLANDS	80	90		170
TONGA	24	24		48
TUVALU	9	7		16
VANUATU	60	80		140
WESTERN SAMOA	20	20		40
G R A N D T O T A L S				
	2718	1167		3885

TABLE F.9

ORBIT LOCATIONS FOR 12-GHz DIRECT BROADCASTING

(Per WARC-77 Final Acts)

NATION	LONGITUDE	CHANNELS
AMERICAN SAMOA	170E	5
BELAU	122E	*
COOK ISLANDS	158E	8
F. S. of MICRONESIA	122E	*
FIJI	152E	3
FRENCH POLYNESIA	160W	4
GUAM	122E	5
MARIANAS	122E	5
MARSHALLS	146E	5
NEW CALEDONIA	140E	4
NAURU	134E	4
NIUE	158E	2
PALMYRA	170E	5
PAPUA NEW GUINEA	110E 128E	4 3
TONGA	170E	2
TOKELAU	158E	4
WAKE	140E	5
WESTERN SAMOA	158E	4
	TOTAL:	73

* The WARC-77 allocated 5 TV channels to the Caroline Islands.

WARC '79 Region 3 Rules and Regulations

Extracted from the "Final Acts of the World Administrative Radio Conference (1979), Geneva, 1979 (Unofficial Version) Volume I: Articles N1/1 to N73; International Telecommunications Union, Geneva, Switzerland" (NTIS Document PB80-148075)

MHz
2 500 - 2 655

Allocation to Services		
Region 1	Region 2	Region 3
2 500 - 2 655 FIXED 3721/364C 3722/364D 3718/360 MOBILE except aeronautical mobile BROADCASTING-SATELLITE 3715/361B 3726/364H	2 500 - 2 655 FIXED 3721/364C 3722/364D FIXED-SATELLITE (space-to-Earth) 3723/364E MOBILE except aeronautical mobile BROADCASTING-SATELLITE 3715/361B 3726/364H	2 500 - 2 535 FIXED 3721/364C 3722/364D FIXED-SATELLITE (space-to-Earth) 3723/364E MOBILE except aeronautical mobile BROADCASTING-SATELLITE 3715/361B 3726/364H 3723B
		2 535 - 2 655 FIXED 3721/364C 3722/364D MOBILE except aeronautical mobile BROADCASTING-SATELLITE 3715/361B 3726/364H
3713/361 3716/362 [illegible] 3717/363 3680D	3714/361A 3680D	3680D

The footnotes for this table are listed on the next page.

Footnotes for the band 2500-2690 MHz in Region 3:

ADD 3680D The bands 1 370 - 1 400 MHz, 2 640 - 2 655 MHz, 4 950 - 4 990 MHz and 15.20 - 15.35 GHz are also allocated to the space research (passive) and earth exploration-satellite (passive) services on a secondary basis.

3715 361B The use of the band 2 500 - 2 690 MHz by the broadcasting-satellite service is limited to national and regional systems for community reception and such use shall be subject to agreement obtained under the procedure set forth in Article N13A. The power flux-density at the Earth's surface shall not exceed the values given in Nos. 6059/470NH to 6062/470NK.

NOC 3721 364C When planning new tropospheric scatter radio-relay links in the band 2 500 - 2 690 MHz, all possible measures shall be taken to avoid directing the antennae of these links towards the geostationary satellite orbit.

MOD 3722 364D Administrations shall make all practicable efforts to avoid developing new tropospheric scatter systems in the band 2 500 - 2 690 MHz.

MOD 3723 364E The use of the bands 2 500 - 2 690 MHz in Region 2 and 2 500 - 2 535 MHz and 2 655 - 2 690 MHz in Region 3 by the fixed-satellite service is limited to national and regional systems; such use shall be subject to agreement obtained under the procedure set forth in Article N13A, giving particular attention to the broadcasting-satellite service in Region 1. In the direction space-to-Earth, the power flux-density at the Earth's surface shall not exceed the values given in 6059/470NH to 6062/470NK.

ADD 3723B Subject to agreement obtained under the procedure set forth in Article N13A, the band 2 500 - 2 535 MHz may also be used in Region 3 for the mobile-satellite (space-to-Earth), except aeronautical mobile-satellite, service for operation limited to within national boundaries.

3726 364H In the design of systems in the broadcasting-satellite service in the bands between 2 500 and 2 690 MHz, administrations are urged to take all necessary steps to protect the radio astronomy service in the band 2 690 - 2 700 MHz.